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by

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Date.... July 12, 1985

Abstract

The aim of this study was to replicate previous work analysing the influence of fundamental attitudes and beliefs on energy resource evaluations and preferences, and to extend previous research by examining the influence of such attitudes and beliefs on conservation behaviours. The specific objectives were: 1) To determine the dimensions of the ecocentric and technocentric modes as a measure of environmental attitudes and to measure the public's attitudes and beliefs according to these positions; 2) To measure the public's preferences about energy options and their awareness and adoption of energy conservation practices; 3) To analyse the influence of the public's fundamental attitudes and beliefs on their energy preferences and conservation behaviours; 4) To evaluate the appropriateness of using fundamental attitudes and beliefs for analysing variations in preferences and behaviours as compared to more traditional methods of explanation, such as the analysis of socio-economic variations.

Data were collected using a self-administered questionnaire survey of Edmontonians. Three hundred and seventy-five questionnaires were delivered in three enumeration districts of the city in a May 1984 survey. Of the 375 questionnaires administered, 260 were returned in a usable form, for a response rate of approximately 69%.

Results from the study suggested that members of the public could be differentiated in terms of their basic values, attitudes and beliefs. Further, there were significant variations in the public's perceptions of conservation, their expectations of and preferences for energy resource options, and their short versus long run energy preferences. Variations in the public's awareness and adoption of conservation practices were apparent. Interrelationships between fundamental attitudes and beliefs and energy resource preferences and behaviours were discerned. Specifically ecocentrists were more conservation minded, more supportive of soft energy paths, and were more aware of and claimed to have adopted a greater number of conservation practices than their technocentric counterparts. Further, fundamental attitudes and beliefs proved a more appropriate mechanism for analysing preferences and behaviours

than the traditional use of socio-economic variables.

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Table of Contents

Chapter — Page

I. INTRODUCTION 1

A. INTRODUCTION 1

B. STUDY OBJECTIVES 3

C. THESIS OUTLINE 4

II. A BEHAVIOURAL APPROACH TO ENERGY ATTITUDES RESEARCH 5

A. INTRODUCTION 5

B. BEHAVIOURAL GEOGRAPHY 6

Definitions 7

C. BEHAVIOURAL GEOGRAPHY AND HAZARD RESEARCH 9

Implications for Energy Perceptions Research 12

D. BEHAVIOURAL ENERGY RESEARCH 14

Perception Research 15

Conservation Behaviour 16

Perceptions And Conservation Behaviour 17

Socio-Economic Variables 18

E. A REVIEW OF PERCEPTION AND CONSERVATION BEHAVIOUR RESEARCH 19

F. FUNDAMENTAL ATTITUDES AND BELIEFS, RESULTS TO DATE 21

G. STATEMENT OF THESIS OBJECTIVES 25

III. METHOD 27

A. INTRODUCTION 27

B. THE QUESTIONNAIRE 27

Attitude Statements For Scale Formation 27

Energy Preferences And Perceptions Of Conservation 33

Conservation Behaviour 34

Socio-economic Characteristics 34

Questionnaire Design 34

C. SURVEY ADMINISTRATION 35

The Pretest 35

Choice Of Sample Areas 35

Sample Methodology 37

Response Rates 38

Socio-economic Frequencies 38

D. DATA ANALYSIS 41

IV. FORMULATION OF THE ATTITUDES SCALE 43

A. SCALE COMPUTATION 43

Subdivision of the Attitudes Scales 43

Recomputations 47

Combined Attitudes Scale 48

B. SOCIO-ECONOMIC VARIATIONS IN ENVIRONMENTAL ATTITUDES ...51

V. PERCEPTIONS OF CONSERVATION AND PREFERENCES FOR ENERGY 56

A. PERCEPTIONS OF CONSERVATION 56

B. PREFERENCES FOR ENERGY OPTIONS 56

C. SOCIO-ECONOMIC VARIATIONS IN EVALUATIONS OF AND PREFERENCES FOR ENERGY CONSERVATION AND RESOURCE USE ..61

D. PERCEPTIONS OF CONSERVATION AND ENVIRONMENTAL ATTITUDES 63

E. ENVIRONMENTAL ATTITUDES AND ENERGY RESOURCE PREFERENCES 64

Expectations of and Preferences for Energy Resource Options (Alberta) ...64

Overall Evaluations and Preferences for Energy Resource Options (Canada) 66

Short-run and Long-run Preferences for Energy Resource Options 66

F. CONCLUSION 69

VI. CONSERVATION BEHAVIOUR AND ENVIRONMENTAL ATTITUDES 72

A. INTRODUCTION 72

B. AWARENESS AND ADOPTION OF CONSERVATION PRACTICES 72

Frequency distributions 73

C. ENVIRONMENTAL ATTITUDES AND ENERGY CONSERVATION BEHAVIOUR 77

Zero Order And Partial Correlations 77

Awareness Of Conservation Practices and Environmental Attitudes 78

Adoption Of Conservation Practices and Environmental Attitudes 80

Crosstabulations 81

D. CONCLUSION 84

VII. CONCLUSIONS 87

A. SUMMARY 87

B. SURVEY LIMITATIONS AND FUTURE RESEARCH DIRECTIONS 91

BIBLIOGRAPHY 93

APPENDIX A 100

APPENDIX B 108

List of Tables

Page

3.1 Classification of attitude statements 28

3.2 Energy attitudes statements 29

3.3 Environmental attitudes statements 30

3.4 Private household incomes by census tract 36

3.5 The socio-economic characteristics (population 15 years of age and older), of Brookside, and those of the survey respondents 39

3.6 The socio-economic characteristics (population 15 years of age and older), of Mcqueen/North Glenora, and those of the survey respondents 40

3.7 The socio-economic characteristics (population 15 years of age and older), of Boyle street, and those of the survey respondents 42

4.1 Definition of the energy and environmental attitudes scales sub-groups 47

4.2 Definition of the combined attitudes scale sub-groups 48

4.3 Combined attitudes scale: mean scores for attitude statements 53

4.4 Socio-demographic variations in attitudes (combined scale) 55

5.1 Expectations and preferences for energy resources in Alberta in the year 2000 57

5.2 Evaluations and preferences for various energy resource options in Canada 59

5.3 Short and long run preferences for hard and soft paths 60

5.4 Socio-economic variations in the perception of conservation 61

5.5 Crosstabulations: socio-economic variations in long term expectations and preferences 62

5.6 Socio-economic variations in evaluations and preferences for energy resource options 63

5.7 The influence of environmental orientation on conservation mindedness and the importance of energy conservation 64

5.8 Long term expectations and preferences in respect to environmental attitude orientations 65

5.9 Mean scores: the influence of attitude orientation on energy evaluations 67

5.10 Environmental position and preferences for short-run energy options 68

5.11 Environmental position and preferences for long-run energy options 69

6.1 Classification of conservation behaviours.....73

6.2 Awareness and adoption of at least one conservation practice: by category 76

6.3 Zero order and partial correlations between awareness of conservation practices, attitude scale and socio-economic variables 79

6.4 Zero order and partial correlations between adoption of conservation practices, attitudes scale and socio-economic variables 81

6.5 Crosstabulations: awareness and adoption of conservation practices in respect to attitude orientation 83

6.6 Crosstabulations: awareness of conservation practices by attitude orientation 83

6.7 Crosstabulations: adoption of conservation practices by attitude orientation.....85

List of Figures

4.1 Energy attitudes scale: mean scores 45

4.2 Environmental attitudes scale: mean scores 46

4.3 Energy attitudes scale: revised mean scores 49

4.4 Environmental attitudes scale: revised mean scores 50

4.5 Attitude classification by respondent scale score 52

6.1 The awareness/adoption gap 74

I. INTRODUCTION

A. INTRODUCTION

Throughout the 1970s and 1980s the issue of energy provision has increasingly entered the public consciousness (Farhar et al., 1980; Gottlieb and Matre, 1976; Jackson, 1985a; McDougall and Keller, 1981; Murray et al., 1974). A major stimulus for this increase in public awareness rests on the O.P.E.C. oil embargo and the subsequent quadrupling of crude oil prices (Mead, 1978). The public and many energy critics have since begun to accept the fact that energy no longer represents an unlimited low-cost resource and that decisions regarding its provision can and do have important implications for the overall structure of society.

Since 1973, many studies of public response to energy have been conducted, from which a reasonably consistent set of findings has emerged. For example, sizable proportions of the public now accept the reality of potential energy shortages. Further, the majority of the populace supports the development of renewable resources as a means of maintaining future energy supplies. In respect to behaviour, the public claims to have initiated widespread conservation practices, but these have tended to require minimal inconvenience and cost to the individual.

However, a number of problems in survey analysis still remain. Studies measuring the public's perceptions of the energy issue have tended merely to analyse short-term, highly volatile responses. Thus, only tenuous links between perceptions of the energy issue and related behaviour have been identified. Further, these results have often proved to be inappropriate to those decision makers determining future energy provision.

Researchers are now in a position to conceptualize issues more thoroughly than before, to develop more rigorous methodologies, and to provide a more appropriate and complete understanding of the interrelationships between public attitudes, preferences and behaviours towards energy. One area of research currently receiving much attention is the analysis of the public's fundamental attitudes and beliefs, and the influence of such belief systems (or world

views) on preferences and behaviours in respect to various social issues. A specific area where this approach seems to have application is in the analysis of energy preferences and conservation behaviours.

Societies, it has been argued, are characterised by a constellation of "common values, beliefs and shared wisdom about the physical and social environment" (Pirages, 1977, p. 6). It is these values and beliefs that help shape societal structure and individual behaviour. There is a controversy over the appropriateness of our present social system and the desirability of a more ecologically benign alternative. It is argued that these two systems may be distinguised according to their mutually exclusive tenets and associated strategies (O'Riordan, 1976; M. Russell, 1979). Further, these may be characterized as lifestyle preferences or world views (Dunlap and Van Liere, 1978, 1984) and can be assumed to represent the outcome of the public's attitudes and beliefs. Jackson (1981) has argued that these world views can be most adequately distinguised in respect to three dimensions, namely man's relationship with the biosphere, the role of technology, and what constitutes improvements in the quality of life. If such fundamental attitudes and beliefs can be analysed, then studies measuring commitment to them may provide important information on the public's preferences for the future, especially about such issues as energy provision and environmental quality.

Research on environmental attitudes is still in its formative stages, but has provided considerable insights. Dunlap and Van Liere, among others, have developed attitude scales to measure the public's world views in respect to environmental issues. Specifically, they have identified a link between pro-environmental attitudes and an ecological world view which they term the "new environmental paradigm" (Dunlap and Van Liere, 1978) and between anti-environmental attitudes and a pro-growth world view which they label the "dominant social paradigm" (Dunlap and Van Liere 1984). Alternative labels for the "new environmental paradigm" and "dominant social paradigm" are used in this study. These are taken from O'Riordan (1976), and are the "ecocentric" and "technocentric" modes respectively.

As a parallel to the ecocentric (new environmental paradigm) and technocentric (dominant social paradigm) modes, energy strategies may be classsified according to two mutually exclusive "paths" (Lovins, 1977): the highly centralized, high technology, hard energy path, and the decentralized, renewable resource-based, soft energy path (Brooks, 1981; Lovins, 1977). If this parallel is indeed correct, then it may be expected that those people who adhere to the ecocentric position would be most likely to support the soft energy path, whereas those whose attitudes and values correspond more closely to the technocentric mode would favour the hard energy path. It is only recently that such a relationship has been tested empirically (Jackson, 1985a, 1985b, 1985c), despite Van Liere and Dunlap's statement "that it is important to determine whether attitudes towards energy use are consistent with attitudes to other environmental issues" (Van Liere and Dunlap, 1981, p.670).

B. STUDY OBJECTIVES

On the basis of ideas drawn from the literature on behavioural geography, resource management, environmental attitudes, and energy preferences and behaviour, a number of study objectives were formulated:

1. To determine the dimensions of the ecocentric and technocentric modes and to measure the public's attitudes and beliefs according to these positions.
2. To measure the public's preferences about energy options and their awareness and adoption of energy conservation practices.
3. To analyse the influence of the public's fundamental attitudes and beliefs on their energy preferences and conservation behaviours.
4. To evaluate the appropriateness of using fundamental attitudes and beliefs for analysing variations in preferences and behaviours as compared to more traditional methods of explanation, such as the analysis of socio-economic variations.

To achieve the objectives, data were collected using a self-administered questionnaire survey of Edmontonians. Three hundred and seventy-five questionnaires were delivered in a

May 1984 survey. A city-wide sample proved impracticable for financial and time reasons, thus three enumeration districts were chosen to be sampled. Of the 375 questionnaires administered, 260 were returned in a usable form, for a response rate of approximately 69%.

C. THESIS OUTLINE

In the following chapter there is a review of the emergence of energy research based on a behavioural perspective. The usefulness of such an approach is analysed and the results from recent energy perceptions and behaviour research are discussed. The methods used for constructing a questionnaire to measure respondents' attitudes and beliefs, and to determine the public's energy preferences and stated behaviours, are discussed in Chapter 3. Chapter 4 is devoted to the construction of an attitudes scale for determining the public's attitudes and beliefs. The results concerning the public's stated energy preferences and behaviours and the influence of world views on such positions are analysed in Chapters 5 and 6. The final chapter provides a summary and review of the major findings of the thesis.

II. A BEHAVIOURAL APPROACH TO ENERGY ATTITUDES RESEARCH

A. INTRODUCTION

A research project considering interrelationships among environmental values, attitudes and beliefs, and energy resource preferences and behaviour requires an assessment of the developing behavioural approach in contemporary geography. Behavioural research has been found to be applicable to a wide spectrum of geographic study, and its constructs have been of central importance to many research areas, including spatial behaviour (Brown and Moore, 1971; Cox, 1969; Golledge, 1969, 1970; Wolpert, 1965), time space geography (Hagerstand, 1968; Pred, 1977; Thrift, 1977), and mental maps (Gould and White, 1974). Other areas of geographic research include resource management, and especially natural hazards (Burton and Kates, 1964; Kates, 1962; Saarinen, 1966; White, 1965, 1974), and studies of historical and cultural geography (Kirk, 1952, 1963; Lowenthal, 1961; Wright, 1947).

For the purpose of the present research programme it is the application of the behavioural approach to energy research which is of direct relevance. Consequently the emergence of energy research based on a behavioural perspective will be reviewed. From this it is argued that a behavioural approach to energy resource issues provides a useful framework for analysing energy preferences and behaviours. Despite the success of previous research, however, several problems remain: these will be addressed in an effort to develop a more appropriate conceptual framework for the present study. It is argued that through an evaluation of more fundamental values, attitudes and beliefs, the public's expectations, preferences and behaviours towards environmental and energy resource issues may be more clearly understood.

B. BEHAVIOURAL GEOGRAPHY

Disenchantment with the traditional approach to geographic analysis provided a major stimulus to the evolution of behavioural geography. It was acknowledged that the theoretical constructs of the traditional spatial analysis approach (perfect knowledge, rational economic man) were inappropriate and that a more realistic view of man and the environment was required (Hamill, 1968; Johnston, 1983; Slovic et al., 1974). Central to this criticism was the fact that when these models were tested they were found to be poor descriptions of reality. As Hamill concludes, "...there are in fact major objections to the use of economic theory as a basis for making decisions about the use of resources or environments" (Hamill, 1968, pp.279-280).

In reaction to the spatial science tradition, and in response to developments in other areas of the social sciences, human geographers have propounded a number of alternative approaches for explaining man-environment relations. These include behavioural geography, phenomenology, welfare geography, and a marxist approach. The behavioural approach is based on the observation of decision-making behaviour about spatial patterns and processes (Johnston, 1983). As Gold states:

> The aim of behaviouralism is to replace the simplistic and mechanistic conceptions that previously categorized much man-environment theory with new versions that explicitly recognise the complexities of behaviour. The behaviouralist views the human subjects of his studies as thinking beings whose actions are mediated by cognitive processes (where cognition is defined as the mental processes by means of which people acquire, organise and use knowledge)....The full spectrum, from sub-conscious impulse to self-conscious deliberation is of concern to the behaviouralist (Gold, 1980, pp.3-4).

This approach represents a more realistic view of man, and a fundamental change in the conceptual approach to understanding human spatial behaviour.

Since the 1960s the behavioural approach has expanded rapidly, encouraged by a plethora of research in the social sciences. The effect of this has been "...that behavioural geography has inherited a 'derived diversity' of conceptual frameworks, methods and empirical data " (Gold 1980, p.37). Despite this, some common themes have emerged which may be categorised into two central traditions. The first, an essentially humanistic approach, is that

adopted by historical and cultural geographers such as Wright (1947), Kirk (1952, 1963), and Lowenthal (1961) and more recently by phenomenologists such as Relph (1970, 1976) and Tuan (1974). Here man is treated as an individual constantly interacting with the environment and changing both himself and his milieu; as such the importance of personal experience is paramount. The second approach, adopted in this thesis, has retained strong ties with the positivist/spatial science tradition. Johnston has argued that the central constructs of this behavioural approach are to "identify how different individuals respond to particular stimuli (and also how the same individual responds to the same stimulus in different situations), to isolate the correlates of those varying responses, and to build models that can predict the probable impact of certain stimuli" (Johnston, 1983, p.157). Many of the theoretical constructs and concepts used in the behavioural approach stem from other social science disciplines, namely, anthropology, political science, psychology and sociology. Some of these, namely perceptions, attitudes, and beliefs, are of direct relevance to this thesis.

Definitions

A central focus of the behavioural approach is the study of perceptions and attitudes. As Gold states, "the key intervening variables in man-environment traditions are perception and cognition...and the concept of an attitude is invaluable in any behavioural study " (Gold, 1980, p.23). Despite their central importance, these components of human thought processes are characterised by ambiguity. Though numerous definitions exist, it is often difficult to find a universally accepted one. Berelson and Steiner define perception as a "process by which people select, organise and interpret sensory stimulation into a meaningful and coherent picture of the world "(Berelson and Steiner, 1967, p.97). This is extended by Saarinen (1966) to include past learning and motivation. Gold defines perception as "the psychological function that enables the individual to convert sensory stimulation into organised and coherent experience " (Gold, 1980, p.20).

Another concept of critical importance to behavioural research is that of attitude. This brings together overt behavioural responses and internal mental life (including perception, motivation and emotion) within one framework (Gold, 1980). Originally the term attitude referred to a person's physical posture or bodily position; however, today in the social sciences this term has come to represent a "posture of the mind". Allport, the founder of attitudes research in social psychology, has cited numerous definitions. Oskamp has listed the important components of these and states: "The aspects stressed in the various definitions include attitude as a mental set or disposition, attitude as a readiness to respond, the physiological basis of attitudes, the permanence, the learned nature, and their evaluative character" (Oskamp, 1977, p.7). Allport has provided a comprehensive definition of his own which has been widely accepted: "an attitude is a mental or neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related" (Allport, 1935, p.805). Fishbein and Ajzen's more recent definition states, "an attitude can be described as a learned predisposition to respond in a constantly favourable or unfavourable manner with respect to a given object" (Fishbein and Ajzen, 1975, p.6). As such, attitudes contain three basic features: an attitude is learned, an attitude predisposes to action, and an attitude remains consistent over time. The time component is of critical importance and relates to the assumption that when a human organism has established a set of internally consistent attitudes, they are resistant to change.

Central to the formulation of attitudes is the concept of belief. The function of a belief is to link an object to some attitude (Fishbein and Ajzen, 1975). For example, the belief that "Canada is a conservative society" links the object "Canada" to the attribute "conservative society". As Fishbein and Ajzen state: "the object of a belief may be a person, a group of people, an institution, a behaviour, a policy, an event etc ., and the associated attribute may be any object, trait, property, quality characteristic, outcome, or event" (Fishbein and Ajzen, 1975, p.12). People generally hold both negative and positive beliefs about an object. It is the sum of these beliefs which can be described as an attitude to an object. It should be noted that

not only do beliefs influence attitudes, but also that previously formed attitudes may influence the development of subsequent beliefs.

If beliefs form the informational base or fundamental building blocks on which attitudes and subsequent behaviour is generated, then a behavioural approach to energy research in which man is viewed as acting essentially rationally (using the information available to him to make judgements, form evaluations and make decisions), seems desirable.

Behavioural geography thus encompasses the important components of perception, attitudes, and beliefs. These theoretical constructs, however, are distinct in character, a set of perceptions tending to be rather more volatile and transitory visions of reality, than an internally consistent set of attitudes.

C. BEHAVIOURAL GEOGRAPHY AND HAZARD RESEARCH

An early geographic application of the behavioural approach was in the area of natural hazard research (Burton et al., 1968; Kates, 1962, 1971; Saarinen, 1966; White, 1965, 1974). As Johnston states: "One of the first attempts by geographers to explore behaviour inductively to provide inputs and later modelling was the series of investigations into human responses to environmental hazards" (Johnston, 1983, p.126). A detailed review of natural hazard research is worthwile at this point since the concepts, hypotheses and findings provide an appropriate framework both for organising the summary of results of research on public response to the energy issue, and for conducting research in the latter area.

Early work in this field was associated with the Chicago school and specifically Gilbert White. The term "natural hazard" is fairly ambiguous, incorporating a wide variety of phenomena such as floods, earthquakes, blizzards, fungal diseases, infestations and even venomous animal bites (Burton and Kates, 1964). However, if only geographic literature is considered then this ambiguity may be reduced. As Gold argues: "If one looks through the geographical literature two things become apparent...geographers are primarily interested in geophysical events...and natural hazards cannot be considered independently of the individuals

and groups that they afflict"(Gold, 1980, p.203). As White states "no natural hazard exists apart from human adjustment to it. It always involves human initiative and choice. Floods would not be hazards were not man tempted to occupy floodplains: by his occupance he establishes the damage potential, and may well change the flood regime itself" (White, 1974, p.3).

The development of hazard research upon systematic lines has provided coherence to the approach, which today serves as an exempler for behavioural geography, resource management, and energy perceptions research. Kates's structural model for hazard research presented in 1962 still provides a central focus for much recent research. The components of the model, taken from Burton et al. (1968), are presented here. They are:

1. Assess the extent of human occupance in hazard zones.
2. Identify the full range of possible human adjustments to the hazard.
3. Study how men perceive and estimate the occurrence of the hazard.
4. Describe the process of adoption of damage reducing adjustments in their social context.
5. Estimate the optimal set of adjustments in terms of anticipated social consequences.

From the development of a conceptual framework for hazard research, a number of consistent findings have been determined. Slovic et al. (1974) argue that three consistent elements of perception and behaviour have been found to characterise human response to natural hazards, namely:

1. **Misperception of risk and denial of uncertainty:** There are extensive data indicating that the risks of natural hazards are misjudged.
2. **Limited range of alternatives perceived and adopted:** It is clear that the resource manager never has available the full range of alternatives from which to make a decision.
3. **Crisis orientation:** Data suggest that public response to natural hazards is crisis oriented.

There are extensive data suggesting that the risk of natural hazards is misjudged by individuals and experts alike (Burton and Kates, 1964). Consequently responses to hazards tend to be crisis oriented, which led Kates to comment that "without repeated experiences, the process whereby managers evolve emergency measures of coping with floods does not take place" (Kates, 1962, p.140). Burton and Kates, using the example of actual policy changes in the conservation

movement, are supportive of this. They contend that, despite the self-image of the conservation movement as a conscious and rational attempt at long-range policy and planning most of the major policy changes have arisen out of crisis generated by catastrophic natural hazards (Burton and Kates, 1964).

The number of alternatives available to individuals or groups when affected by natural hazards tends to be limited. White argues that the resource manager never has available the full range of alternatives from which to make a decision (White, 1965, 1974). "More generally no individual is aware of the full theoretical range of choice" (Jackson, 1980a, p.117). Ittelson et al. state that hazard research has established four central reasons why human reaction varies in this way.

1. In most areas disasters occur with relative infrequency; they are not part of our daily lives. Infrequent perception of hazard conditions leads to distortions in conceptualising the environment. The threat (stimulus) is seen as potential and remote rather than immediate and real.
2. We are dealing with events over which, it is assumed, man has limited control.
3. These events often require major adjustments in our way of life, which people are usually reluctant to make.
4. Information from the hazard environment is frequently ambiguous; it provides us with a paucity of reliable cues. As a result, judgements are less accurate than is normally the case with other environments (Ittelson et al., 1974, p.310).

Personal factors influencing these aspects of perception and behaviour include previous experience, personality, attachment to place, and attitudes towards nature. How people assess the magnitude and frequency of hazards will depend primarily on an individual's previous experience. For example, Saarinen in his 1966 study of the drought-prone Great Plains of the U.S.A. concluded "in general the farmers tend to take an optimistic stance in relation to drought frequency. Almost to a man they under-estimate the frequency of meteorological drought" (Saarinen 1966, p.139). Crop successes were recalled more often than failures.

Personality provides another important insight into human response to natural hazards; however, much of the evidence on this subject remains inconclusive. Sims and Baumann (1972) argue that personality is an important component in the explanation of man's response to natural hazards. Despite this, results from numerous studies (Fischer, 1972; Kirkby, 1972; Levenson, 1972) have proved contradictory. This may partially be explained with reference to

the different methods used in the individual studies. As Schiff states, "...despite the questions raised about the validity of the Sims and Baumann study and the failure of this and other studies...to find support for a relationship between coping behaviour and specific personality variables, it is not suggested that the search for personality variables related to the adoption of adjustments to hazards is fruitless" (Schiff, 1977, p249).

A more understood, if not more important factor, is that of attachment to place. This may be explained by the fact that many natural hazard environments, for example seashores and mountain ranges, are areas of perceived intrinsic value; as Tuan states "...environnments of persistent appeal" (Tuan, 1974, p.114).

Attitudes to nature provide another underlying factor to Ittelson et al.'s conclusions. Kluckhohn (1959) suggests a simple typology of man's attitudes to nature, and indicates that culture has a strong influence. Man may either be subject to, exist in harmony with, or actually dominate nature. Pre-industrial societies typified the view of man being subject to nature, while many of today's societies see the ability to dominate nature through the application of technology. The third alternative, that of harmony with nature, typifies ecological thought on the natural environment.

Implications for Energy Perceptions Research

Many of the theoretical constructs applicable to energy attitudes research can be traced back to the field of natural hazards, with its established set of behavioural constructs. Persuasive arguments for the use of a conceptual framework based on hazard research were initiated by Jackson (1978, 1980a). He argued that no new conceptual framework for energy conservation studies was required, as the concepts and theories derived from natural hazard research were the most relevant.

Fundamental to Jackson's argument is the identification of a number of of linkages between natural hazards and resources (or resource scarcity). The first is a conceptual one: "both resources and hazards are culturally and functionally defined" (Jackson 1980a, p.116).

Physical and biological elements in the environment are "neutral stuff" which become resources only as a function of the value placed upon them by man (Hunker, 1964). Or as Burton et al. state:

> natural systems are neither benevolent nor maliciously motivated toward their members: they are neutral, in the sense that they neither prescribe nor set powerful constraints on what can be done with them. It is people who transform the environment into resources and hazards, by using natural features for economic, social and aesthetic purposes (Burton et al., 1978, pp.19-20).

Through this value orientation by man, hazards and resources can be viewed in a positive or negative manner. Hazards can be categorized as negative resources. The similarities between resources and natural hazards becomes even clearer when the variables defining them are considered. The damage potential from natural hazards is directly related to human activity. For example, certain types of social and economic investment in an area of a hazard may not only determine the level of damage but may even increase the potential frequency of an event's occurrence. Alternatively, investment in damage-reducing adjustments may alleviate the effects of hazards. Similarly, the relative abundance or scarcity (determined by the value placed on the resource) of resources are not only the result of the availability of materials in the physical environment, but are also affected by the patterns of exploitation and conservation as determined by changes in men's perceptions of economic, social and technological conditions. Thus a second linkage is behavioural, in that human responses to the environment, whether it be a resource or a hazard, modify man-environment relations in essentially the same way.

Accepting this, resources and hazards may be defined in a similar manner by virtue of the common linkages which characterise the relationship between environmental and human systems. As Jackson states, "Resources are valuable and desirable, and hazards are the reverse; however resource scarcity is conceptually similar to hazards in that they both represent unacceptable breakdowns in man-environment relations" (Jackson, 1980a, p.116). Given the comparability of the potential impact on the human environment by hazards and resource scarcity, the common conceptual definitions, and the similar role that the adjustment process plays in alleviating resource and hazard problems, it seems reasonable to propose that people will perceive and respond to energy resource scarcities and hazards in a similar manner. "Thus,

the findings of hazard research may be used to develop research questions about energy perceptions and conservation behaviour" (Jackson, 1980a, p.116).

D. BEHAVIOURAL ENERGY RESEARCH

> "From the end of World War 2 until the fall of 1973, the United States luxuriated in an era of inexpensive and abundant energy supplies. Energy fueled strong economic growth and a rising standard of living, and America became hooked on cheap energy" (J. Russell, 1979, p.5).

This soon changed when the United States and the rest of the world felt the influence of the O.P.E.C. oil embargo. Not only did the Arab oil producers drastically cut their exports, but all oil exporting nations raised prices. As Mead states "from 1970 through 1977, nominal prices of gasoline (excluding excise taxes) more than doubled, while noncontrolled crude oil prices increased more than fourfold" (Mead, 1978, p.2). The resultant increase of gasoline and oil prices, queues at gas stations, and demands for energy conservation encouraged the coining of the phrase "energy crisis", which has become synonymous with the embargo's consequences (J. Russell, 1979). The awareness that energy (from hydrocarbons) was not an unlimited resource encouraged the acceptance that energy dictated economic and social costs as well as benefits to society. Researchers were quick to accept this and a plethora of studies were initiated from public and private sources. These considered intricate linkages between such issues as energy provision and the quality of the environment, with an emphasis on the public's perceptions and behaviours towards a number of specific energy questions. These may be categorised into two main themes:

1. **Studies relating to the perception of energy resources**; incorporating such issues as belief in an energy crisis, measurement of its perceived seriousness, the degree of concern over its effects and questions relating to "who is to blame".
2. **Research concerned with conservation behaviour**; incorporating questions relating to the awareness and adoption of specific conservation practices or adjustments to energy resource problems.

As much of the research has been undertaken independently, it often lacks a common theoretical perspective, making it difficult to collate a common set of research findings. Despite

this some common themes have been summarized in the form of bibliographic essays (Farhar et al., 1980; Jackson and Foster, 1982; Olsen and Goodnight, 1977).

Perception Research

The oil embargo of 1973 introduced the concept of an energy crisis to the North American public, but it took the rest of the decade for its implications to become generally understood and accepted. Even by 1978 only 50% of the respondents in a U.S. national survey knew that their country was an energy importer (Resources for the Future, 1978). Research on the public's perceptions of the "energy crisis" tackled a broad spectrum of issues. These stimulated such questions as, "Is there an energy crisis?" "Who is to blame?" and "What energy sources are preferred for the future?"

Increasing public concern over the energy issue appears to have produced two diverging sets of public perceptions:

1. People who blame government ineptness and manipulation by the oil companies, and see the energy crisis as being contrived rather than real (Cunningham and Lopreato, 1977; Foster and Jacobs, 1980).
2. People who believe that the world is facing long term energy problems as a physical shortage of resources now exists (Cunningham and Lopreato, 1977).

Obviously between these two poles of perception a continuum of views exists. Despite this there is considerable evidence that the energy resource problem has "...failed to assume a dominant position in the minds of most people" (Jackson and Foster, 1982, p.10). McDougall and Keller conclude that "in comparison to such issues as inflation, pollution or unemployment the Canadian public has consistently felt that the energy shortage was the least important issue" (McDougall and Keller, 1981, p.4).

In the area of preferences for future resource use, studies indicate that the public would prefer an energy program based on renewable resources. A multi-response, Harris study in New York (1978), found that of their sample, 44.7% chose solar energy, against 14% who

chose coal and 8% who favoured nuclear power. These results are supported among others by U.S. national surveys (1977, 1979) and Canadian research such as Brady (1980). Farhar et al. conclude: "One pattern evident in these studies is a majority preference for the development of solar energy in the immediate future, with the expressed hope that it will be a significant national energy producer by the year 2000" (Farhar et al., 1980, p.148).

Conservation Behaviour

Research suggests that the public recognises the importance of and benefits derived from personal conservation of energy, and that this is often translated into action. Cunningham and Lopreato report that a majority of their sample, "...had made substantial efforts to conserve energy" (Cunningham and Lopreato, 1977, p.64).

Despite this, increased conservation is sometimes believed to create personal costs, which may lead to a conflict between lifestyle and conservation. The problems of uncertainty in the decision making process tend to exacerbate this problem. Further, habitual ingrained patterns of energy consumption may be resistant to change (Sadler, 1980).

It would seem that though the public often initiates conservation behaviour this generally requires little expense or inconvenience. Various U.S. studies have reported figures ranging from 60 to 90 per cent of respondents making adjustments to home heating and lighting (Bultena, 1976; Cunningham and Lopreato, 1977; Gottlieb, 1974), while available figures suggest that more significant forms of conservation behaviour have been less widely adopted. Cunningham and Lopreato reported that a significant number of respondents initiated simple conservation practices such as "always turning out lights when not needed" (65.3%), or "turning the air conditioning off during the day while away in the summer" (66.6%). This however proved not to be the case for measures requiring more "work" or "significant expenditure". Only 10.3% of their sample had made substantial efforts to install storm windows (Cunningham and Lopreato, 1977). Similar results have been reported by Canadian researchers (Jackson, 1980a; Keller and McDougall, 1980).

It is clear that the public is not necessarily aware of all the conservation practices open to it. However, they are probably aware of a significant variety. Further though the public may be aware of a large number of conservation practices, they do not adopt all of these. Jackson (1980a) suggests that such a gap exists between awareness and adoption because economic and/or inconvenience costs incurred from conservation practices are prohibitive. He further concludes, "...awareness is a necessary, but not a sufficient precondition for the adoption of conservation practices" (Jackson, 1980a, p.122). Obviously studies that centre on overt behaviour will have to consider actual or stated adoption rather than purely relying on an individual's awareness of conservation practices.

Perceptions And Conservation Behaviour

Numerous researchers have examined the possibility of links between perceptions and behaviour (Assael and Day, 1960; Farhar et al., 1980; Fishbein, 1963), while others have attempted to identify and interpret such links (Allen et al., 1980; Brady, 1980; Foster and Jacobs, 1980; Gottlieb and Matre, 1976; Jackson, 1980a). Jackson and Foster argue that this "...offers one of the potentially most fruitful directions for understanding and explaining behaviour" (Jackson and Foster, 1982, p.15). Results indicate that some correlations between energy resource perceptions and conservation have been identified. Generally, those people expressing the greatest concern over resource scarcity exhibit greater propensities for developing new energy conserving behaviours (Jackson, 1980a; McDougall et al., 1979). Keller and McDougall amplify this point in their 1980 study. Here respondents were split into four categories based on their stated attitudes to the energy crisis (ranging from concerned [1] to unconcerned[2]), and their conservaton pratices were then compared. Keller and McDougall found that 90% of concerned respondents reported turning off lights to conserve energy, while

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[1] "Concerned" are those who thought the energy shortage was very or somewhat serious and that efforts by individuals to conserve energy were very or somewhat important.

[2] "Unconcerned" are those who thought the energy shortage was not too or not at all serious and that efforts by individuals to conserve energy were not too or not at all important.

the figure for unconcerned respondents was 70%. With regard to "using less water" the figures were 58% to 32% respectively (Keller and McDougall, 1980, p.3).

Accepting this a number of problems in identifying associations between perceptions and behaviours exist. The findings of Keller and McDougall (1980) amplify this point. We have a situation where in some cases unconcerned respondents were initiating conservation behaviours while concerned respondents were not. Jackson, in a study of Albertans, found that the perceived seriousness of energy issues acted as a poor predictor of the adoption of specific conservation practices and that responses to attitude statements were related neither to specific practices nor to the range of adjustments perceived and adopted (Jackson, 1980a, 1980b). Other studies have failed to identify any association between perceptions and behaviour (Morrison, 1975; Morrison and Gladhart, 1976; Warren, 1974; Warren and Clifford, 1975). Some of these inconsistencies in results may be explained by different methodological constructs; however, we can at most conclude that a very tenuous link between perception and behaviour exists.

Socio-Economic Variables

Socio-economic variables have been widely examined as sources of variation in both perception and conservation behaviour. Of these, income has proved to be the most reliable variable for explaining variations in energy consumption, perception of energy problems, and the adoption of conservation practices (Kilkeary, 1975; Murray et al., 1974; Newman and Day, 1975). Other variables cited heavily in the energy attitudes literature include age (Cunningham and Lopreato, 1977; Jackson, 1980a), education and occupation (Jacobs and Foster, 1980), ethnic origin (Bartell, 1974), and sex (Bartell, 1974). Researchers have often combined the results of socio-economic variables to provide a classification of the "conserver" and "non conserver". For example Cunningham and Loperato indicate that "in most cases those individuals who were classified as more energy-conserving were lower-income, less educated, and more likely to be of a minority race or ethnic group than were the less energy-conserving

subjects"(Cunningham and Lopreato, 1977, p.75).

The number of functions that socio-economic variables may fullfill in perception and behavioural research provides the rationale for their use. Socio-economic variables may be used as a taxonomy for explaining variations in the public's perceptions and behaviours. The desirability of such variables is further enhanced by their ease of determination and their potential use as control variables. Despite this, the use of socio-economic variables has often produced contrasting results, indicating the difficulty of identifying and interpreting socio-economic variations in energy perception and conservation behaviour. This can be illustrated using the income variable. Cunningham and Lopreato (1977) and Gottlieb and Matre (1976) found concern increasing with income, while Kilkeary (1975) and Warren (1974) indicate concern is concentrated in the middle income groups; these results contradict Murray et al. (1974) and White (1975) who found no relationship. Results of this type lead us to question the relevance of socio-economic variables as determinants of individual and societal attitudes and preferences. Despite this ambiguity, socio-economic variations in perceptions and behaviours have been found and as such, they should therefore be included in future research work, if only as control variables.

E. A REVIEW OF PERCEPTION AND CONSERVATION BEHAVIOUR RESEARCH

In their conclusion to a bibliographic essay on research into public response to the energy issue in the 1970s, Jackson and Foster have commented:

> the formative stages are now complete and the results from fragmented studies are beginning to take shape as a coherent body of findings. The essential dimensions of perceptions, attitudes, preferences and behaviours have been identified and described, typologies of behaviour have begun to be developed, some basic understanding of the influences of perceptions, attitudes and preferences on behaviour has been attained and there is evidence of socio-economic differences in energy consumption and conservation (Jackson and Foster, 1982, p.33).

Essentially the general public now accepts the reality of an energy crisis, though there is disagreement as to "who is to blame". Further results suggest that a majority of the populace supports the development of renewable resources as a means of alleviating future energy

shortages. With respect to behaviour the public claims to have initiated widespread conservation practices, though these have tended to be characterised by action which requires minimal inconvenience and cost to the individual. In summary, a number of theoretical and empirical advances have been made in the research field of energy perceptions and behaviour.

Despite this, some problems with research methods used in analysing energy perceptions and behaviours remain.

1. Researchers have often based their surveys on the public's perceptions of the energy issue, despite the volatile and transitory nature of such perceptions;
2. Weak links between the public's stated energy preferences and their actual behaviour have been identified;
3. Researchers have often analysed the public's stated rather than their actual behaviour, despite the fact that statements of intent do not necessarily translate into actual behaviour;
4. Researchers have often used socio-economic variables to explain variations in the public's preferences and behaviours, despite their inherent deficiencies;
5. Researchers have often failed to recognise the important influence of values and beliefs on the public's perceptions and actual behaviour.

Similar criticisms have been leveled at the behavioural approach in general. As Bunting and Guelke state: "The results of behavioural and perception research are of little value in the explanation of real world human geographical activity" (Bunting and Guelke, 1979, p.462).

The recognition of inconsistencies between and deficiences of the present research methods now places researchers in a position to conceptualise issues more thoroughly, develop more rigorous techniques and subsequently provide a better understanding of the interrelationships among the public's attitudes, preferences and behaviours. One potential avenue of research to accomplish this rests on the analysis of fundamental values, attitudes and beliefs, and their influence on energy resource preferences and conservation behaviours.

It is argued that the use of internally consistent attitudes and beliefs as determinants of behaviour are more appropriate than the use of volatile perceptions. Further such an approach

may prove more useful for explaining variations in preferences and behaviours than the traditional use of statistics such as socio-economic variables. In summary it is contended that a conceptual framework based on fundamental attitudes and beliefs will provide a better research framework for analysing perceptions and behaviours than the alternative approaches used to date.

F. FUNDAMENTAL ATTITUDES AND BELIEFS, RESULTS TO DATE

It is argued that fundamental attitudes and beliefs may be characterized in respect to two internally consistent though diametrically opposed positions (Jackson, 1981; O'Riordan, 1976; M. Russell, 1979). One, the technocentric mode (O'Riordan, 1976) defends traditional societal structures and is supportive of economic growth, material wellbeing and centralised technological development. The other, the ecocentric mode (O'Riordan, 1976) rejects such a development strategy and questions mankind's use (abuse) of the environment and dependence on technological change. This mode advocates a more ecologically benign decentralised development strategy.

Numerous authors have provided seemingly different, but often very similar classifications of these two opposing positions. Terms corresponding to the technocentric mode include the expansionists (M. Russell, 1979), the technocratic (Drengson, 1980), the cowboy economy (Boulding, 1966), and the dominant social paradigm (Dunlap and Van Liere, 1984). The alternative labels for the ecocentric mode include the limited world view (M. Russell, 1979), the person planetary (Drengson, 1980), the space-man economy (Boulding, 1966), and the new environmental paradigm (Dunlap and Van Liere, 1978).

Based on a review of this and other comparable literature (Commoner, 1976; Eyre, 1978; Kahn et al., 1976; Kahn, 1982; Maddox, 1972; Ophuls, 1977), Jackson (1981, 1983a) has concluded that three main dimensions discriminate between the ecocentric and technocentric positions, namely perceptions of the biosphere, views on technology, and attitudes towards the quality of life. Thus according to Jackson (1985b):

> the technocentric position is broadly characterized by an internally consistent set of perceptions of a biosphere which is unlimited as regards both the supply of materials and its capacity to absorb wastes and other impacts, an unbounded technology to exploit nature, an inherent optimism about the prospects for sustained economic growth, and an assessment of the quality of life primarily in material and quantitative terms. The other position represents a similarily internally consistent yet directly opposite complex of beliefs and preferences, in which a limited biosphere is viewed as imposing constraints on technology and the possibilities for economic growth, which in turn is viewed as undesirable, given the negative environmental and social consequences which proponents of this position argue are inevitable unless the 'growth ethic' is rejected. A re-direction of material aspirations is therefore demanded, and the quality of life is assessed primarily in qualitative and less tangible terms (Jackson, 1985b, pp. 5-6).

From Jackson's review of the resource debate literature it seems apparent that advocates of the technocentric and ecocentric modes may be clearly identified with regard to their respective positions on nature, technology, and the quality of life. Subsequently, studies concerned with the public's support for either position should develop research questions based on these three underlying dimensions. Such a policy is followed in the thesis to choose attitude statements for the formulation of attitude scales. This follows the same conceptual framework as used in a number of research studies analysing such interrelationships.

Research though in its formative stages has considered such issues in relation to environmental attitudes (Dunlap and Van Liere, 1978, 1984; Cotgrove, 1982) and specifically energy provision (Jackson, 1985a, 1985b, 1985c). Dunlap and Van Liere (1978) attempted to develop an instrument to measure the ecocentric position, which they termed the New Environmental Paradigm (N.E.P.). The instrument designed was a scale based on a set of twelve statements, deemed characteristic of the dimensions of the N.E.P. To measure the public's acceptance of the N.E.P. Dunlap and Van Liere administered a questionnaire to two samples of Washington state residents, a general public sample (G.P.S.), and a sample from state wide environmental organisations (E.O.S.). Acceptance of these statements was seen as being consistent with the characteristics of the N.E.P. Results suggested that the public accepted the content of the N.E.P. much more than had been expected. To test the predictive power of the scale, Dunlap and Van Liere hypothesised that E.O.S. respondents would score

more highly than the G.P.S. respondents.[3] The hypothesis proved to be correct.

In a subsequent study, Dunlap and Van Liere (1984) extended their research to consider links between the Dominant Social Paradigm (D.S.P.) and preferences for environmental quality. Two important factors analysed in their study were:

1. the measurement of the D.S.P.;
2. a consideration of the relationship between dimensions of the D.S.P. and several measures of concern for environmental protection (the hypothesis being that individual commitment to the D.S.P. was negatively related to environmental concern).

To determine the characteristics of the D.S.P., Dunlap and Van Liere developed several sub-scales, which were subsequently aggregated and tested using factor analysis. In relation to commitment to the D.S.P. and environmental concern they found that the results of bivariate and multivariate analysis supported their hypothesis.

Cotgrove (1982), working in the U.K., reported results similar to those of Dunlap and Van Liere. In an attempt to determine the varying degrees of support for the two contrasting positions, Cotgrove administered a questionnaire (between 1978 and 1980) to five distinct groups: the public, industrialists, trade union officials, "new environmentalists", and nature conservationists. Like that of Dunlap and Van Liere, Cotgrove's questionnaire was based on a series of attitude statements that were deemed characteristic of the various dimensions of the N.E.P. and D.S.P. Results indicated that the contrasting nature of the diametrically opposed positions was most clearly amplified by the respective attitudes of the environmentalists as opposed to the industrialists. For example, in respect to social ideals, environmentalists tended to support non material growth, were critical of free market mechanisms and technological development, but were supportive of community participation. Industrialists by contrast were advocates of economic growth, technological development, market mechanisms and individualism.

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[3]The higher the score the more supportive of the ecocentric mode.

Results to date from research on environmental concern are encouraging and support the theorised relationship between fundamental attitudes and beliefs and subsequent attitudes and preferences; however, little work has been initiated in interrelated fields such as resource use and energy provision, despite Van Liere and Dunlap's statement "that it is important to determine whether attitudes towards energy use are consistent with attitudes to other environmental issues" (Van Liere and Dunlap, 1981, p.670).

One exception to this is Jackson's preliminary investigation of environmental attitudes and preferences for energy resource options (1985a, 1985b, 1985c). He argues that questions relating to energy provision are not merely questions about energy but more fundamentally about preferences for lifestyles. As the public's attitudes and beliefs may be differentiated according to the ecocentric and technocentric modes so may the public's preferences for energy be differentiated according to the "hard" versus "soft" energy path. These it is argued are closely tied to the ecocentric and technocentric modes.

A central tenet of the technocentric mode is the acceptance of the hard energy path. This essentially represents an extrapolation of society's recent energy policies, and is characterised by the centralized, tchnology-oriented use of fossil fuels and is based on the future acceptance of nuclear power as the major energy source (Kahn, 1982; Maddox, 1972; Mienel and Mienel, 1979). The soft path it is contended, is by contrast directly linked to the ecocentric mode. This is based on renewable resource based energy supplies, extracted and generated by environmentally appropriate decentralised technologies (Hooker et al., 1981; Lovins, 1977). The two positions may thus be distinguished not on how much energy is used, but on the technical and socio-political structure of the energy system used.

To test this relationship between fundamental attitudes and beliefs and energy preferences, Jackson initally undertook a study of undergraduates enrolled in geography courses at the University of Alberta (1985b), and subsequently a survey of the general public (1985a, 1985c). In both cases associations between environmental attitudes (measured as world views in a manner similar to that developed by Dunlap and Van Liere, 1978, 1984), and certain

aspects of energy perceptions and preferences were analysed. Jackson hypothesised that a preference for hard energy paths would be associated with adherence to the technocentric position, while support for soft energy paths would be consistent with the ecocentric position. Results supported the hypothesis, and Jackson was able to argue that the interrelationships between fundamental systems of values and beliefs are not only related to environmental attitudes but also to perceptions of the energy issue. This represents an important advancement in our understanding of the whole energy issue; however, what is required is a reaffirmation of Jackson's study, plus an additional analysis of the interrelationships between fundamental attitudes and beliefs and the public's stated behaviours.

G. STATEMENT OF THESIS OBJECTIVES

A review of the relevant literature indicates a series of advances in our understanding and measurement of the inter-relationships between the public's values, attitudes and beliefs, and their subsequent preferences. It is also clear that by drawing together developments in the fields of resource management, environmental concern and energy use, researchers may be able to determine empirically the interrelationships between fundamental attitudes and beliefs and energy preferences and behaviour. From the preceding review, the general framework of this research study was developed, and its objectives formulated.

It is the aim of this thesis to determine whether the public's energy preferences and behaviour can be understood with reference to their fundamental values, attitudes and beliefs. More specifically, the objectives of the study are as follows:

1. To develop an environmental/energy attitudes scale whereby the public's attitudes may be measured (Chapter 4);
2. To examine the relationship between the environmental/energy attitudes scale and preferences for distinct energy options (Chapter 5);
3. To determine the public's awareness of conservation practices and their reported conservation behaviour (Chapter 6);

4. To assess relationships between environmental/energy attitudes and the awareness and adoption of conservation practices (Chapter 6).

III. METHOD

A. INTRODUCTION

The data were collected using a self-administered questionnaire completed by 260 respondents selected from three census tracts in the City of Edmonton. The survey was conducted in May 1984.

B. THE QUESTIONNAIRE

The questionnaire (Appendix A) was divided into four sections: attitudes towards environmental and energy resource issues; evaluations of and preferences for energy resource options; awareness and adoption of conservation practices; and socio-economic characteristics.

Attitude Statements For Scale Formation

A significant part of the questionnaire was devoted to the measurement of environmental attitudes. A procedure recently employed by various researchers (Cotgrove, 1982; Dunlap and Van Liere, 1978, 1984; Jackson, 1985a), has been to develop a series of attitude statements from which the scores could be amalgamated to form an attitudes scale. For the purpose of this thesis, two series of attitude statements were included in the questionnaire. One concentrated on energy-specific attitudes, while the other emphasised a more general set of issues related to the environment, technology, and the quality of life.

Initially one hundred and forty-eight statements in the resources, environmental, and attitudes literature were selected as the basis for constructing the attitudes scales. These were then organised into the three underlying dimensions which Jackson (1981) argues are characteristic of the attitudes reflected in the ecocentric and technocentric modes. A set of criteria was formulated to reduce the one hundred and forty-eight statements to a number that would tap sufficient and appropriate information, namely:

1. All statements used by Dunlap and Van Liere (1978) were retained for comparability

reasons;

2. Duplicate statements were removed;
3. Statements reported in previous studies to be inappropriate measures of attitude were removed.

From the original statements thirteen energy and twenty-three environmental attitude statements were chosen to construct two attitude scales. The statements reflected a balance between ecocentrically-oriented and technocentrically-oriented statements (Table 3.1); nevertheless, it was necessary in some instances to modify their content or precise wording (Tables 3.2 and 3.3).

TABLE 3.1
CLASSIFICATION OF ATTITUDE STATEMENTS

Dimensions	Technocentric	Ecocentric	Total
Limits to the biosphere	1-A, 11-D, 11-I, 11-P, 11-R,	1-F, 11-E, 11-G, 11-L, 11-T, 11-U, 11-V, 11-B,	13
Faith in technology	1-C, 1-G, 1-I, 1-K, 11-C, 11-S,	1-D, 1-J, 11-K, 11-M, 11-N,	11
Quality of life	1-E, 1-H, 1-M, 11-A, 11-F, 11-H,	1-B, 1-L, 11-J, 11-O, 11-Q, 11-W,	12
Total	17	19	36

With respect to the energy attitudes scale, of the thirteen statements chosen, six were taken directly from previous research papers. The remaining seven statements were modified in order to remove confusion in the statement, to make statements explicit, and to emphasize critical words. For example, statement 1-A was modified from a general statement about the

TABLE 3.2
ENERGY ATTITUDES STATEMENTS

Statement	Source	Modification
1-A. There is no threat of an oil or natural gas shortage, only a shortage of known and identified resources*	Foster and Jacobs 1980	NO
1-B. The price of energy should include the cost of preventing or repairing environmental damage due to energy development	Jackson 1985a	YES
1-C. Solving energy problems is best left to the experts*	Jackson 1985a	NO
1-D. The solution to energy problems is the development of renewable sources of energy such as solar or wind power	Jackson 1985a	YES
1-E. Environmental quality may have to be sacrificed to guarantee adequate supplies of energy*	Foster and Jacobs 1980	NO
1-F. Canada's supplies of oil and natural gas are rapidly being depleted	Jackson 1985a	YES
1-G. Improved technology is the key to avoiding energy shortages in the future*	Jackson 1985a	YES
1-H. Energy costs must be kept down, even if this means a reduction in environmental protection*	Jackson 1985a	NO
1-I. Nuclear power plants can be operated without a threat to the quality of the environment*	Jackson 1985a	NO
1-J. In the future individuals should be expected to purchase solar or wind devices to meet part of their own energy requirements	Foster and Jacobs 1980	NO
1-K. The development of nuclear power plants is the best way to meet future energy needs*	Jackson 1985a	YES
1-L. Moderation in consumption at the individual level can contribute significantly to energy conservation	Foster and Jacobs 1980	NO
1-M. The environmentalists needlessly interfere with energy projects and the rapid development of our oil, natural gas, and coal reserves*	Foster and Jacobs 1980	YES

* Statement scores reversed during analysis

TABLE 3.3
ENVIRONMENTAL ATTITUDES STATEMENTS

Statement	Source	Modification
11-A. In the long run, there are no limits to the extent to which we can raise our standard of living*	Jackson 1985a	NO
11-B. The earth is like a spaceship with only limited room and resources	Dunlap and Van Liere 1978	NO
11-C. We can continue to raise our standard of living through the application of science and technology*	Dunlap and Van Liere 1984	YES
11-D. Plants and animals exist primarily to be used by humans	Dunlap and Van Liere 1978	NO
11-E. Humans must live in harmony with nature in order to survive	Dunlap and Van Liere 1978	NO
11-F. Economic growth improves the quality of life for all Canadians*	Dunlap and Van Liere 1984	YES
11-G. The balance of nature is very delicate and easily upset	Dunlap and Van Liere 1978	NO
11-H. Too much has been written about the costs and problems of economic growth, and not enough about the benefits	Jackson 1985b	NO
11-I. Humans have the right to modify the environment to suit their needs*	Dunlap and Van Liere 1978	NO
11-J. Canadians are going to have to dramatically reduce their consumption of material goods over the next few years	Dunlap and Van Liere 1984	YES
11-K. Science and technology often do as much harm as good	Dunlap and Van Liere 1984	YES
11-L. When humans interfere with nature, it often produces disastrous consequences	Dunlap and Van Liere 1978	NO

* Statements scores reversed during analysis

TABLE 3.3 (continued)
ENVIRONMENTAL ATTITUDES STATEMENTS

Statement	Source	Modification
11-M. More emphasis should be placed on teaching children about nature than on teaching them about science and technology	Original	--
11-N. We cannot keep counting on science and technology to solvemankind's problems	Dunlap and Van Liere 1984	NO
11-O. In general, the Canadian people would be better off if the nation's economy stopped growing	Dunlap and Van Liere 1984	YES
11-P. Mankind was created to rule over the rest of nature*	Dunlap and Van Liere 1978	NO
11-Q. To maintain a healthy economy we will have to develop a "steady-state" economy where industrial growth is controlled	Dunlap and Van Liere 1978	NO
11-R. Humans need not adapt to the natural environment because they can remake it to suit their needs*	Dunlap and Van Liere 1978	NO
11-S. Improved technology is the key to a better society and prosperity in the future*	Jackson 1985b	NO
11-T. We are approaching the limit to the number of people the earth can support	Dunlap and Van Liere 1978	NO
11-U. Mankind is severely abusing the environment	Dunlap and Van Liere 1978	NO
11-V. There are limits to growth beyond which our industrialised society cannot expand	Dunlap and Van Liere 1978	NO
11-W. Rapid economic growth often creates more problems than benefits	Dunlap and Van Liere 1984	NO

* Statement scores reversed during analysis

unlikelihood of an energy shortage to a specific statement about the unlikelihood of an oil and natural gas shortage. In statement 1-D, the original word "rapid" was removed to allow respondents to indicate a preference, regardless of time constraints. In 1-K, the statement, "the development of nuclear power is one of the best ways to meet Canada's future energy needs" was modified to "the development of nuclear power is the best way to meet future energy needs", the rationale being to make respondents express whether or not they felt nuclear power was the single best energy option. Foster and Jacobs's statement (1-M) was reoriented to emphasise the potentially detrimental impact of environmental concern group activity on energy provision.

In the environmental attitudes section of the questionnaire, seventeen of the twenty-three statements used were taken directly from previous work. These included the twelve statements used by Dunlap and Van Liere (1978) to construct their "New Environmental Paradigm" scale. Five of the remaining six questions were derived from previous research papers, while the remaining statement, 11-M was suggested to the author (Rodgers, 1984). As in the energy attitudes scale, statements were modified to make them more explicit while retaining their conciseness. For example, question 11-J was made explicit by the addition of "material goods" to the original statement, while in 11-K the word "often" was introduced to remove the restrictive definition of the original statement. Further, some statements were modified to make them relevant to the Canadian rather than the American public. For example, in questions 11-F and 11-J, the original statements used the terms "U.S. Citizens" and "Americans" respectively. These were replaced by the term "Canadians".

Having selected the appropriate attitude statments, a five point Likert scale was used to measure variations in the public's responses. For each statement in the scales, respondents were asked to indicate the extent to which they agreed or disagreed. Each item was accompanied by five response categories, these being: strongly agree, agree, neutral, disagree, and strongly disagree, which were assigned values of 1,2,3,4 and 5 respectively. For purposes of aggregation, the scores assigned to the technocentrically-oriented statements were reversed. Thus a low score

uniformly represented an ecocentric position.

Energy Preferences And Perceptions Of Conservation

Five pre-coded questions, drawn from previous research and modified where appropriate, were used to measure respondents' evaluations of and preferences for energy resource options. In Questions 6 and 7 (modified from Brady, 1980), respondents were asked: "In the year 2000 which two of the following do you think will be the main sources of energy used in Alberta?" and "In the year 2000 which two of the following sources of energy would you prefer to be used in Alberta?" In each question respondents were presented with nine energy options, namely oil, coal for domestic use, natural gas, hydro-electric power, nuclear power, coal for electricity generation, solar energy, wind energy, and biomass fuels. Similar though distinct data were obtained in Questions 8, 9 and 10. Initially respondents were presented with a general evaluation question asking: "How would you rate each of the following as ways in which Canada might make a major effort to improve its energy situation?" and then asked to rate seven options (coal, conserving energy, oil and natural gas, solar energy, biomass fuels, nuclear power, and oil from tar sands), according to whether they felt each was (1)poor, (2)fair, (3)good, (4)very good, or (5)excellent. In Question 9, respondents were asked to select the two options they felt would "help to improve Canada's energy situation the fastest (in the next five years)". The same procedure was used in Question 10, with the exception that long-run preferences (beyond the year 2000) were identified. Questions 8, 9, and 10 were altered slightly from Jackson (1985b), which were originally taken from an American survey sponsored by the Union Carbide Corporation (1980).

To determine the public's evaluations of the importance of individual efforts to conserve energy, respondents were asked: "How important do you feel it is that individuals like yourself make an effort to cut down the amount of energy that they use?" (Question 2). Following this respondents were asked to evaluate themselves as conservers in comparison with their peers (Question 3). These two questions were based on Jackson (1985b).

Conservation Behaviour

It would have been desirable to measure individuals' actual behaviour; however, for reasons of time, access to information, and other practical limitations, respondents' reported rather than observed behaviours were analysed using identical questions as in Jackson (1980a). Initally, respondents were presented with the statement: "Please list the ways that you know of in which individuals and households can conserve energy" (Question 4). Subsequently, they were asked: "Which of the preceding list have you or your household adopted in the last two years?" (Question 5). The heterogeneity of available conservation practices precluded the use of a limited option question format. Further, it was felt that the provision of a list of conservation behaviours might have influenced the respondent. Therefore, an open-ended question format was used.

Socio-economic Characteristics

The final section of the questionnaire requested information on the socio-economic characteristics of the respondent. Four socio-economic questions were used, namely sex, age, educational attainment, and total annual household income. To encourage the completion of this section it was emphasised that individual responses would be treated confidentially and that the information obtained would only be used for classification purposes. Further, in each question, respondents were presented with a series of response categories rather than being asked to specifically indicate their socio-economic characteristics.

Questionnaire Design

The questionnaire was designed following the principles of the Total Design Method (Dillman, 1978). Thus the style of statements, their length, and their location in the questionnaire were all designed to produce a clear and concise document that the respondent could easily understand and complete. To encourage this, instructions were capitalised and important commands underlined. The socio-demographics section was left to the end of the

questionnaire as it was felt that respondents would be more willing to divulge such information having completed the questionnaire thus far. Space was also provided to allow respondents to make additional comments.

C. SURVEY ADMINISTRATION

The Pretest

The questionnaire was pretested before being administered to the public. Two groups were chosen for the pretest. Initially, several professors and graduate students in the Department of Geography, the University of Alberta, with a knowledge of questionnaire design and the research subject, were asked to identify any problems with the questions, statement format, and the structure and wording of the questionnaire. Suggested changes were made and the questionnaire was then presented to an undergraduate class. Comments were noted and alterations were made to the questionnaire.

Choice Of Sample Areas

The study was conducted in Edmonton. Financial limitations and time constraints precluded sampling the total city population; however, a survey of just under four hundred households in selected areas of the city was deemed appropriate. Specifically, three enumeration districts of the city were chosen and 125 questionnaires were administered in each, using a stratified random sampling technique. Each of the areas chosen had distinct economic characteristics and, in combination, allowed a cross section of the public to be analysed. In choosing the areas to be surveyed, a number of criteria had to be satisfied, with income characteristics as the prime determinant. The annual average household incomes of all enumeration districts in Edmonton were recorded (Census Canada, 1981). Those areas whose populations had the highest, lowest, and closest household incomes to the city average were short-listed as suitable survey areas (Table 3.4). Other criteria used for selection included

TABLE 3.4
PRIVATE HOUSEHOLD INCOMES BY CENSUS TRACT

Census tracts	Household income	Dwellings in census tract
Highest private household income		
005.01	$60,373	715
009.00	$56,366	1860
007.02	$52,821	1240
Average private household income[1]		
049	$28,881	1570
75.01	$28,803	630
023	$28,723	2643
Lowest private household income		
045	$15,070	1100
034	$15,133	2935
046	$17,620	2495

[1] Average private household income $28,887.
Source: Census Canada 1981.

uniformity of housing type and the number of dwellings in the census tract. Taking these factors into consideration, the census tracts of Brookside (005.01), Boyle Street (45), and McQueen/North Glenora (49), were chosen to be surveyed. Brookside was chosen because it has the highest average private household income and has a uniform housing base. Boyle Street was selected for the same reasons, with the exception that it has the lowest average household income of any census tract in Edmonton. Finally McQueen/North Glenora exhibited average household income characteristics most similar to that of the city as a whole. The uniformity in housing type of these areas removed the likelihood of large scale intra-district income variations.

Sample Methodology

Once the survey areas had been determined, potential respondents were selected from the 1984 Edmonton telephone directory. All dwellings located in any of the three selected enumeration districts that had a telephone number were noted using the reverse directory. Specifically, names, addresses, and phone numbers were recorded. At this stage, any address that was a business or had some other non-residential function was removed. A stratified random sample of the remaining addresses was undertaken. To administer a uniform number of questionnaires to each of the enumeration districts, the total number of surveyable addresses in each area was divided by 125 (the number of questionnaires chosen to be delivered). The total number of available dwellings in Brookside was 522, thus a questionnaire was administered at a frequency of one per every fourth house. In Boyle Street (762) and McQueen/North Glenora (1265), the proportion was every sixth and tenth dwelling respectively. For administration purposes, a single address was randomly selected in each area and was used as the base from which every subsequent respondent could be selected. During the administration of the questionnaire, if a respondent was absent or unable to accept the questionnaire, it was delivered to the house immediately to the right or, if necessary, to the house immediately to the left of the residence originally selected. In order to acquaint respondents with the aims of the research programme, a letter of introduction was attached to the questionnaire (Appendix B), which indicated the reasons for the survey and the author's credentials, and emphasized that the responses would be treated confidentially and that the survey was independent of government.

During a three-week period in May 1984, 375 questionnaires were personally delivered, and responses collected from the three sample areas. Questionnaires were normally delivered during weekday evenings and all day on weekends, the rationale being that many potential respondents would be absent during the day in the week. Where possible, personal contact was made with the respondent to encourage completion of the questionnaire. Respondents were asked to leave completed forms in their mail box where they could be collected later without inconveniencing the respondent. Where collection proved difficult (for example, when there

was no readily accessible mail box), individuals were contacted by phone and collection of the questionnaire was arranged.

Response Rates

Of 375 questionnaires administered in the May 1985 survey, 264 were returned; 4 were found to be incomplete and were removed, leaving 260 completed questionnaires for a response rate of 69.3%. The return rates for the respective enumeration districts varied from 45.6% in Boyle Street, to 79.2% in McQueen/North Glenora, and 82.4% in Brookside. The variations in response rates may be partially attributed to the socio-economic characteristics of the census tracts. Many individuals from Boyle Street were found to be either illiterate and/or to experience language problems therefore limiting their ability to complete the questionnaire. The number of rooming houses and apartments in the area also proved inhibiting, an experience similar to that of Fairbairn and Gilham (1985) who have also worked in this area. Other problems included lack of respondent interest in the subject, their fear that personal rights were being impinged upon, and the lack of door bells and mail boxes. In Brookside and McQueen/North Glenora these factors were less apparent, and respondents tended to be more sympathetic to the requirements of the surveyor.

Socio-economic Frequencies

To determine the representativeness of the survey sample in respect to the three enumeration districts, respondents' socio-economic characteristics solicited in the questionnaire were compared with the socio-economic characteristics reported for the respective census tracts (Census Canada, 1981). For comparison purposes, the population analysed in the census data was 15 years of age or older.

An analysis of the socio-ecomomic characteristics of Brookside and that obtained in the survey indicated a number of minor differences (Table 3.5).

TABLE 3.5
THE SOCIO-ECONOMIC CHARACTERISTICS (population 15 years of age and older) OF BROOKSIDE[1], AND THOSE OF THE SURVEY RESPONDENTS

Socio-economic variables	Census tract		Survey sample	
	n	%	n	%
Sex				
Male	980	50.8	59	61.5
Female	950	49.2	37	38.5
Total	1930		96	
Age				
15-25	585	30.3	13	12.7
25-44	710	36.8	44	44.1
>44	635	32.9	45	44.1
Total	1930		102	
Income				
<$15,000	50	7.0	3	3.4
$15,000 to $30,000	80	11.2	5	5.6
>$30,000	585	81.8	81	91.0
Total	715		89	
Education				
Up to Secondary	725	35.8	11	10.7
Post Secondary to Some University	645	31.9	41	39.8
At least a University Graduate	655	32.3	51	49.5
Total	2025		103	

[1] Source: Census Canada 1981.

More males than females were surveyed, while the age distribution of those completing the questionnaire was older than expected. For example, 88.2% of the sample was over 25 years of age compared to 69.7% as recorded in the 1981 census. The income characteristics of the sample population in Brookside were very similar to those expected. For instance, over 80% of respondents in both the survey and the census reported incomes of greater than $30,000. In respect to education, a higher percentage of the survey sample was found to have graduated

from university than expected and thus respondents with lower educational attainments were under-represented.

Similar trends were apparent for McQueen/North Glenora (Table 3.6).

TABLE 3.6
THE SOCIO-ECONOMIC CHARACTERISTICS (population 15 years of age and older) OF MCQUEEN/NORTH GLENORA[1], AND THOSE OF THE SURVEY RESPONDENTS

Socio-economic variables	Census tract		Survey sample	
	n	%	n	%
Sex				
Male	1745	49.2	59	61.5
Female	1805	50.8	37	38.5
Total	3550		96	
Age				
15-25	915	25.8	15	15.3
25-44	1015	28.6	30	30.6
>44	1620	45.6	53	54.1
Total	3350		98	
Income				
<$15,000	415	26.3	12	13.3
$15,000 to $30,000	505	31.9	27	30.0
>$30,000	660	41.8	51	56.6
Total	1580		90	
Education				
Up to Secondary	1705	49.6	31	32.3
Post Secondary to Some University	1360	39.5	43	44.8
At Least a University Graduate	375	10.9	22	22.9
Total	3440		96	

[1] Source: Census Canada 1981.

Again males were over-represented in the survey, and the respondents were older than expected. Further the high income group was over-represented in the survey while the low

income group was under-represented. For example, 56.6% of the survey had an income of greater than $30,000 compared to 41.8% reported for the census tract. In respect to educational attainment, there was a higher percentage of the more educated in the survey than expected.

In Boyle Street (Table 3.7), the skewedness experienced in Brookside and McQueen/North Glenora in respect to higher incomes and educational attainment was repeated. However, unlike Brookside and McQueen/North Glenora the surveyed population tended to be younger than that reported in the census rather than older. The sex demographics of those surveyed in Boyle Street were close to that recorded for the total population in the census tract.

In summary, the socio-economic characteristics of those surveyed in the sample were not identical to the census data. Specifically higher percentages of males, the wealthy, and the better educated were surveyed than expected. The skewedness was not surprising considering the fact that the more wealthy and better educated groups of the survey were found to be more receptive to the questionnaire than the less educated and poor. Further, the time lag between the census and the survey may explain some of the variation. Ideally, the survey sample should have been exactly representative of the enumeration districts surveyed. This proved not to be the case; however, as a cross-section of the public were actually surveyed, an analysis of public attitudes to environmental and energy resource issues was possible.

D. DATA ANALYSIS

The data collected in the questionnaire were coded and then entered into the computer. Questionnaire coding was simplified by the fact that predetermined category numbers usually served as response codes. In order to ensure consistency in the coding procedure, all the coding was done by the researcher. An underlying principle in the coding procedure was the maintenance of data in a disaggregated form. This was especially important in the coding of open-ended questions. Only at a later stage of analysis, when it became apparent that some data required aggregation, were the data collapsed.

TABLE 3.7
THE SOCIO-ECONOMIC CHARACTERISTICS (population 15 years of age and older) OF BOYLE STREET[1], AND THOSE OF THE SURVEY RESPONDENTS

Socio-economic variables	Census tract		Survey sample	
	n	%	n	%
Sex				
Male	1315	67.1	35	60.3
Female	645	32.9	23	39.7
Total	1960		58	
Age				
15-25	345	17.6	17	29.3
25-44	570	29.1	16	27.6
>44	1045	53.3	25	43.1
Total	1960		58	
Income				
<$15,000	695	62.6	23	43.4
$15,000 to $30,000	280	25.2	22	41.5
>$30,000	135	12.20	8	15.1
Total	1110		53	
Education				
Up to Secondary	1390	69.3	27	47.4
Post Secondary to Some University	495	24.7	24	42.1
At Least a University Graduate	120	6.0	6	10.5
Total	2005		57	

[1] Source: Census Canada 1981

The statistical procedures included simple frequency distributions, crosstabulation, correlation analysis, and analysis of variance. During analysis, the 0.05 level was used to determine the statistical significance of association between variables.

IV. FORMULATION OF THE ATTITUDES SCALE

A. SCALE COMPUTATION

As previously noted, many researchers contend that it is more useful to analyse attitude statements collectively in a single scale than to consider them individually. To achieve this, responses to the energy and the environmental attitudes statements were scored in respect to respondents' ecocentric/technocentric orientation and subsequently aggregated. For the energy attitudes scale, the theoretical minimum and maximum scores were 13 and 65 respectively. The actual scores obtained ranged from 21 to 51. In the environmental attitudes scale, the theoretical minimum and maximum scores were 23 and 115, while the observed scores ranged from 34 to 81.

Once the scales had been computed, the legitimacy of treating the two sets of statements as single scales was substantiated using the SPSSx reliability test. This test performs an item analysis of the components of additive scales by computing Cronbach's *alpha* coefficient of reliability. Test scores range from zero to one, with a score of 0.4 or greater indicating an acceptable level of reliability. The *alpha* scores obtained for the energy and environmental attitudes scales were 0.58 and 0.78 respectively.

Subdivision of the Attitudes Scales

Respondents were then classified into one of a series of attitude categories, the assumption being that individuals whose total scale scores were similar would share similar attitudes and beliefs. Specifically, the scales were subdivided into four attitude groups:

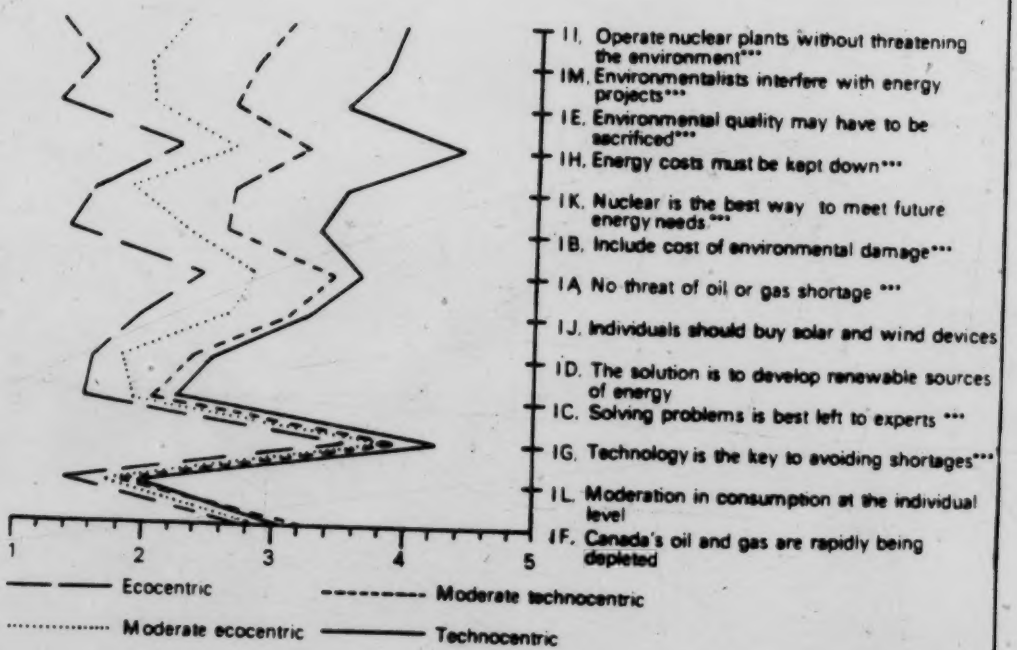
1. **Ecocentrists** -Attitudes consistent with the ecocentric mode.
2. **Moderate Ecocentrists** -Attitudes indicative of, but not totally consistent with, the ecocentric mode.
3. **Moderate Technocentrists** -Attitudes indicative of, but not totally consistent with, the technocentric mode.

4. **Technocentrists** -Attitudes consistent with the technocentric mode.

As total scores on both scales were found to approximate a normal distribution (energy scale, skewness= 0.06; environmental scale, skewness= 0.11), the four categories were determined using the procedure adopted by Jackson (1985a), by making subdivisions at the mean and plus or minus one standard deviation above and below the mean. To evaluate the appropriateness of combining the separate items of the energy and the environmental attitudes scale into single measures, an analysis of variance was carried out using the SPSSx breakdown package. This calculated the mean-score for each statement according to the four sub-groups of the sample. Theoretically the mean-scores obtained should vary significantly, and in a manner consistent with the expected direction. Specifically, ecocentrists would exhibit a low mean score, moderate ecocentrists the second lowest score, moderate technocentrists the second highest score, and technocentrists the highest score. This proved to be the case for 31 of the 36 statements (Figures 4.1 and 4.2). For example, in statement 1-A ($p<0.0001$) the mean scores obtained for all respondents in each category were, ecocentric (2.49), moderate ecocentric (2.87), moderate technocentric (3.5), and technocentric (3.72). For five of the 36 statements, however, the actual mean scores obtained were not consistent with the expected trend, so the statements were removed. In the energy attitudes scale (Figure 4.1), 1-F was excluded because the mean score obtained for moderate technocentrists (3.36) was higher than that obtained for technocentrists (3.28). 1-G was also removed because the mean scores for the moderate ecocentrists and the moderate technocentrists were the same. In the environmental attitudes scale (Figure 4.2), 11-B was excluded because the mean score obtained for the moderate technocentrists was higher than that obtained for the technocentrists, while in 11-J and 11-Q the mean score for ecocentrists was the same as or higher than that recorded for the moderate ecocentrists.

FIGURE 4.1

ENERGY ATTITUDES SCALE :* MEAN SCORES


Mean-scores**
Statements
1
2
3
4
5
1I. Operate nuclear plants without threatening the environment***
1M. Environmentalists interfere with energy projects***
1E. Environmental quality may have to be sacrificed***
1H. Energy costs must be kept down***
1K. Nuclear is the best way to meet future energy needs***
1B. Include cost of environmental damage***
1A. No threat of oil or gas shortage ***
1J. Individuals should buy solar and wind devices
1D. The solution is to develop renewable sources of energy
1C. Solving problems is best left to experts ***
1G. Technology is the key to avoiding shortages***
1L. Moderation in consumption at the individual level
1F. Canada's oil and gas are rapidly being depleted
Ecocentric
Moderate technocentric
Moderate ecocentric
Technocentric

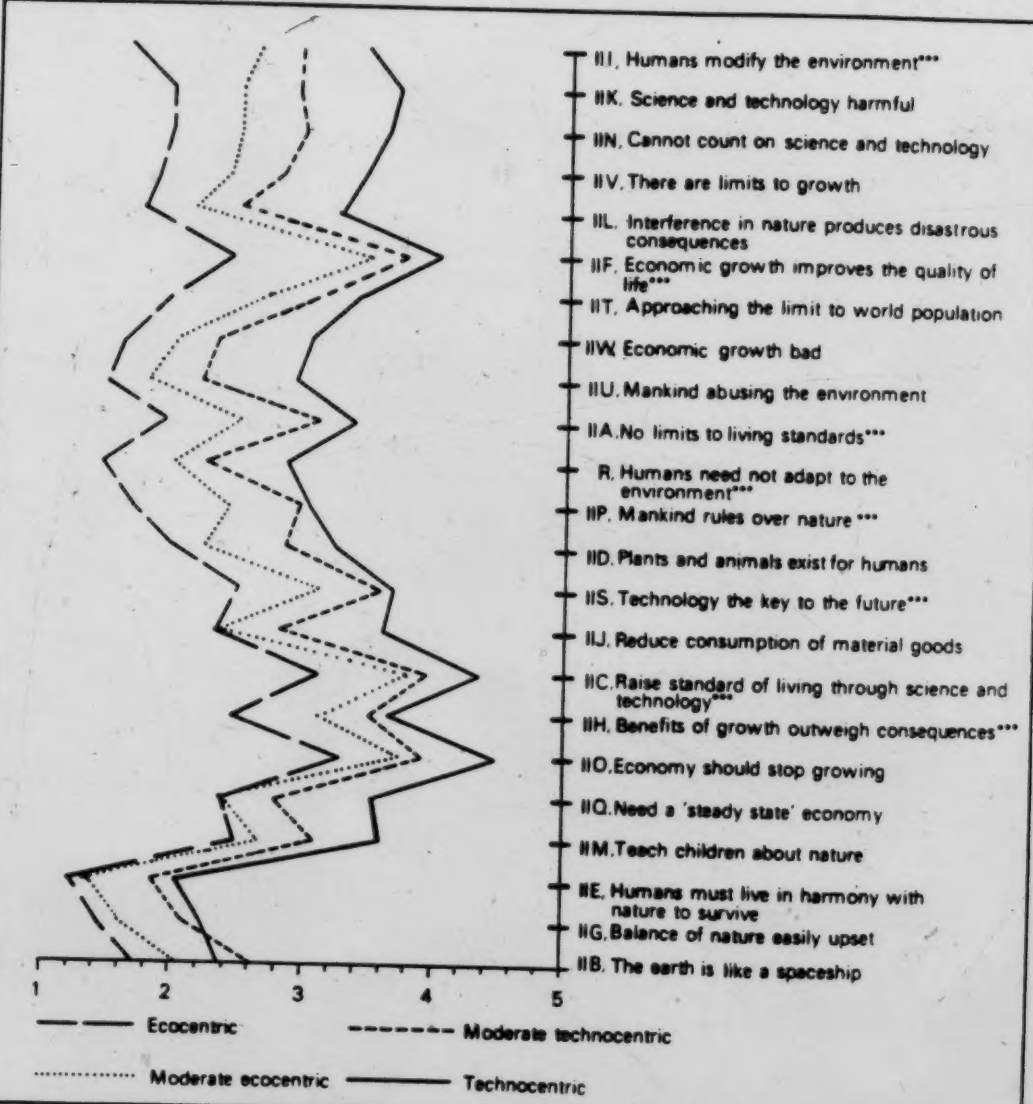
*See Q-I of questionnaire appendix A, for complete statements

**Mean-scores based on strongly agree 1; agree 2; neutral 3; disagree 4; strongly disagree 5.

***Scores were reversed for the calculation of mean-scores.

FIGURE 4.2

ENVIRONMENTAL ATTITUDES SCALE:* MEAN SCORES


Mean scores**
Statements
IIL. Humans modify the environment***
IIK. Science and technology harmful
IIN. Cannot count on science and technology
IIV. There are limits to growth
IIL. Interference in nature produces disastrous consequences
IIF. Economic growth improves the quality of life***
IIT. Approaching the limit to world population
IIW. Economic growth bad
IIU. Mankind abusing the environment
IIA. No limits to living standards***
R. Humans need not adapt to the environment***
IIP. Mankind rules over nature***
IID. Plants and animals exist for humans
IIS. Technology the key to the future***
IIJ. Reduce consumption of material goods
IIC. Raise standard of living through science and technology***
IIH. Benefits of growth outweigh consequences***
IIO. Economy should stop growing
IIQ. Need a 'steady state' economy
IIM. Teach children about nature
IIE. Humans must live in harmony with nature to survive
IIG. Balance of nature easily upset
IIB. The earth is like a spaceship
1
2
3
4
5
Ecocentric
Moderate technocentric
Moderate ecocentric
Technocentric

*See Q-II of questionnire, appendix A, for complete statements.

**Mean-scores based on strongly agree 1; agree 2; neutral 3; disagree 4; strongly disagree 5.

***Scores were reversed for the calculation of mean-scores

Recomputations

The removal of five statements from the energy and environmental attitudes scales required that each scale be recomputed. The reclassified energy attitudes scale now contained 11 statements, so the theoretical minimum and maximum scores were 11 and 55 respectively, while the actual scores obtained ranged from 21 to 51. In the reclassified environmental attitudes scale 19 statements remained, producing a theoretical minimum scale score of 19 and a maximum of 95. The actual scores obtained ranged from 44 to 82. The *alpha* scores for the revised scales were 0.65 and 0.76 respectively. Respondent scores generated from the recomputed scales again approximated a normal distribution (energy scale, skewness= 0.075; environmental scale, skewness= 0.003). Subsequently, the boundaries for the four classified groups were again located at the mean and one standard deviation above and below the mean. In Table 4.1, the range of scores, the frequency of respondents, and resultant percentages of the sample population in each category for the revised scales are shown.

TABLE 4.1
DEFINITION OF THE ENERGY AND ENVIRONMENTAL ATTITUDES SCALES SUB-GROUPS

Orientation	Scale-score range	n	%
Energy Scale			
Ecocentrists	21-28	41	16.5
Moderate Ecocentrists	29-34	87	34.9
Moderate Technocentrists	35-41	92	37.0
Technocentrists	42-51	29	11.6
Total	--	249	100.0
Environmental Scale			
Ecocentrists	34-46	37	15.3
Moderate Ecocentrists	47-54	82	33.9
Moderate Technocentrists	55-62	85	35.1
Technocentrists	63-81	38	15.7
Total	--	242	100.0

To complete the recomputation and validation of the scales the breakdown procedure was repeated (Figures 4.3 and 4.4). The mean scores obtained for all statements were consistent in that uniformly ecocentrists' scores were always lowest, the moderate ecocentrists' scores second lowest, the moderate technocentrists' scores the second highest, and the technocentrists' scores always the highest.

Combined Attitudes Scale

Having constructed two scales, both measuring essentially the same dimensions, it was felt that they could be amalgamated to develop a combined scale. The justification for this was that a combined scale of thirty-one statements would remove the necessity of analysing all relationships between attitudes and energy preferences or behaviours twice. The standardised item *alpha* score obtained for the thirty-one statements was 0.80, a score consistent with other study findings. Dunlap and Van Liere (1978, 1984) report *alpha* coefficients ranging from 0.70 to 0.88, while Jackson (1985a) indicates an *alpha* of 0.81. The *alpha* score obtained for the combined attitudes scale significantly improved upon those recorded for the energy specific (0.65) and environmental (0.76) attitudes scales.

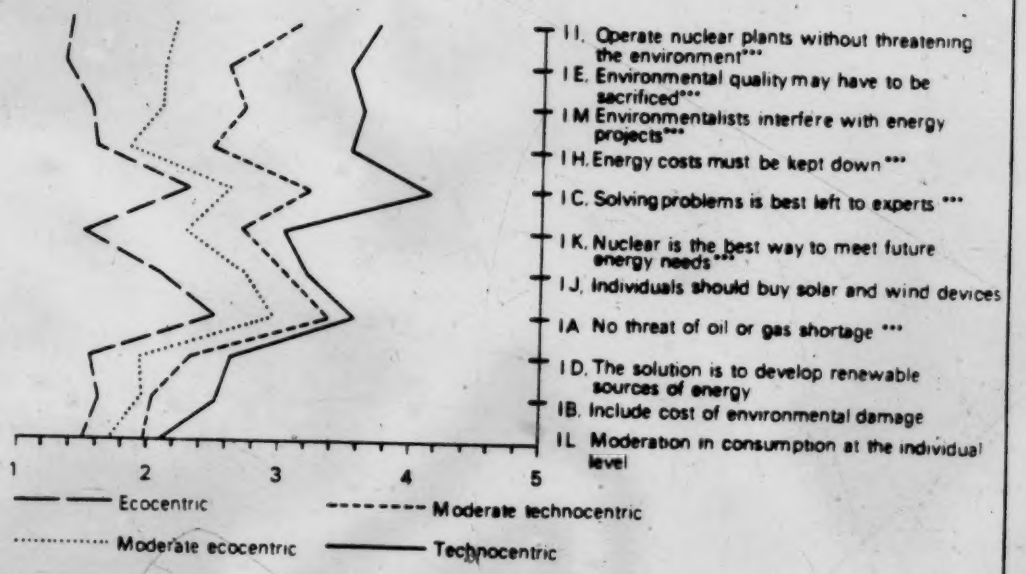
The theoretical minimum and maximum scores for the combined scale were 31 and 155 respectively, while actual respondent scores were found to range from 53 to 122 (Table 4.2).

TABLE 4.2
DEFINITION OF THE COMBINED ATTITUDES SCALE SUB-GROUPS

Orientation	scale-score range	N	%
Ecocentrists	53-69	32	13.4
Moderate Ecocentrists	70-81	85	35.8
Moderate Technocentrists	82-93	78	32.7
Technocentrists	93-122	43	18.1
Total	--	249	100.0

FIGURE 4.3

ENERGY ATTITUDES SCALE:* REVISED MEAN SCORES


Mean-scores**
Statements
1
2
3
4
5
I I. Operate nuclear plants without threatening the environment***
I E. Environmental quality may have to be sacrificed***
I M Environmentalists interfere with energy projects***
I H. Energy costs must be kept down***
I C. Solving problems is best left to experts ***
I K. Nuclear is the best way to meet future energy needs***
I J. Individuals should buy solar and wind devices
I A No threat of oil or gas shortage ***
I D. The solution is to develop renewable sources of energy
I B. Include cost of environmental damage
I L Moderation in consumption at the individual level
Ecocentric
Moderate technocentric
Moderate ecocentric
Technocentric

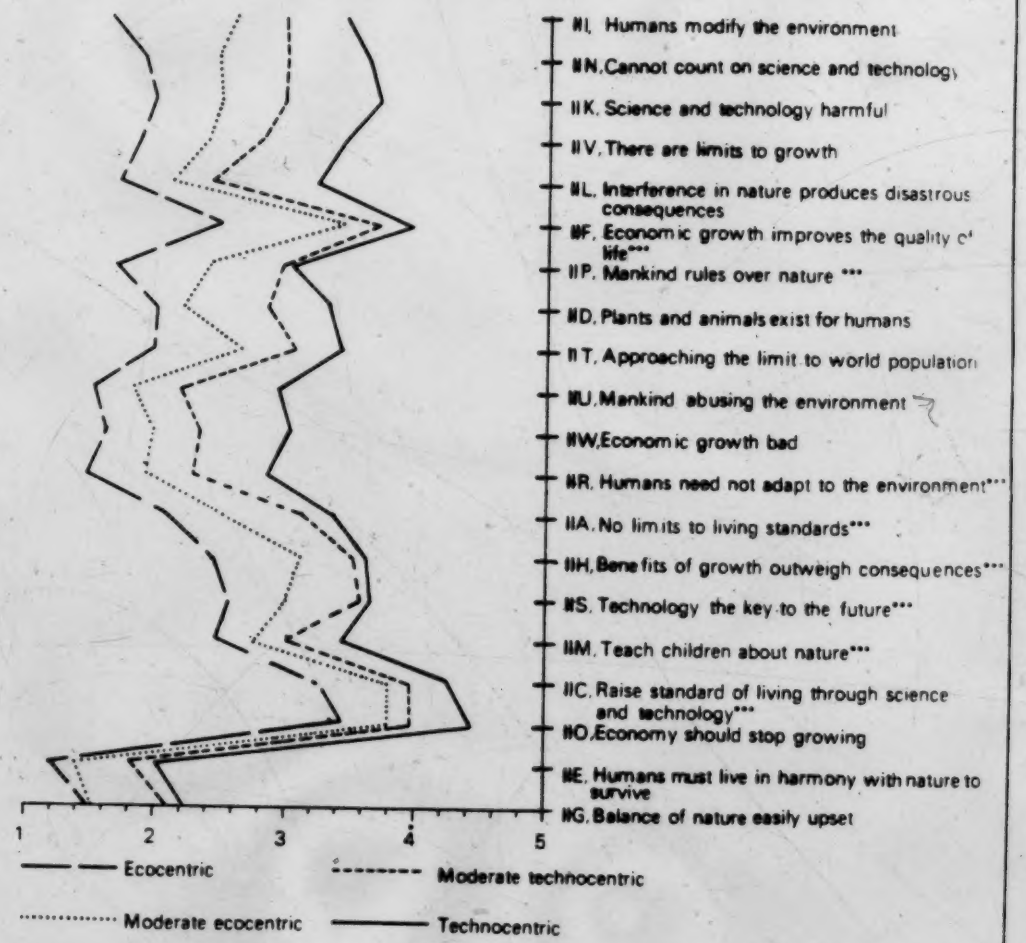
*See Q-I of questionnaire, appendix A, for complete statements.

**Mean-scores based on strongly agree 1; agree 2; neutral 3; disagree 4; strongly disagree 5.

*** Scores were reversed for the calculation of these mean-scores.

FIGURE 4.4

ENVIRONMENTAL ATTITUDES SCALE:* REVISED MEAN SCORES


Mean-scores**
Statements
#I. Humans modify the environment
#N. Cannot count on science and technology
#K. Science and technology harmful
#V. There are limits to growth
#L. Interference in nature produces disastrous consequences
#F. Economic growth improves the quality of life***
#P. Mankind rules over nature ***
#D. Plants and animals exist for humans
#T. Approaching the limit to world population
#U. Mankind abusing the environment
#W. Economic growth bad
#R. Humans need not adapt to the environment***
#A. No limits to living standards***
#H. Benefits of growth outweigh consequences***
#S. Technology the key to the future***
#M. Teach children about nature***
#C. Raise standard of living through science and technology***
#O. Economy should stop growing
#E. Humans must live in harmony with nature to survive
#G. Balance of nature easily upset
1
2
3
4
5
Ecocentric
Moderate technocentric
Moderate ecocentric
Technocentric

*See Q-II of questionnire appendix A. for complete statements

**Mean-scores based on strongly agree 1; agree 2; neutral 3; disagree 4; strongly disagree 5

***Scores were reversed for the calculation of these mean-scores

All respondent scores were then plotted in aggregations of five (Figure 4.5) to indicate the range and distribution of scores obtained in the survey. Though the observed mean did not coincide with the theoretical mean, the frequency distribution of the amalgamated scale approximated that of a normal distribution. This allowed the four categories to be defined as follows: ecocentrists (total score more than one standard deviation below the sample mean; 13.4%); moderate ecocentrists (score <1 s.d. below the mean; 35.8%); moderate technocentrists (score <1 s.d. above the mean; 32.7%); and technocentrists (score >1 s.d. above the mean; 18.1%) (Table 4.2). 68.5% of all respondents were classified as either moderate ecocentrists or moderate technocentrists. This suggests that the majority of the public are not totally supportive of either the ecocentric or technocentric modes, a result consistent with other research findings (Jackson, 1985a). However, the fact that the actual mean was located to the left of the theoretical mean may indicate that the public has adopted "ecocentric" attitudes to a greater extent than would be theoretically expected. This corresponds to results reported by Dunlap and Van Liere (1978) and Jackson (1985a).

To test the discriminating power of the combined scale, an analysis of variance for all statements was performed. The assumption that the mean-scores obtained for each statement would vary in a manner consistent with a low mean-score for ecocentrists, and a high mean score for technocentrists, proved to correct (Table 4.3).

B. SOCIO-ECONOMIC VARIATIONS IN ENVIRONMENTAL ATTITUDES

The main focus of this thesis is to analyse the influence of environmental attitudes on preferences and reported behaviours towards energy. Previous research, however, has suggested that environmental attitudes may be influenced by socio-economic factors. To test the potential influence of socio-economic variables on environmental attitudes, an analysis of variance was performed (Table 4.4). The results indicate that environmental attitudes did not vary significantly with age, sex, education, and income. Thus, there was no need to control for these variables in any subsequent analysis of attitudes.

FIGURE 4.5

ATTITUDE CLASSIFICATION BY RESPONDENT SCALE SCORE

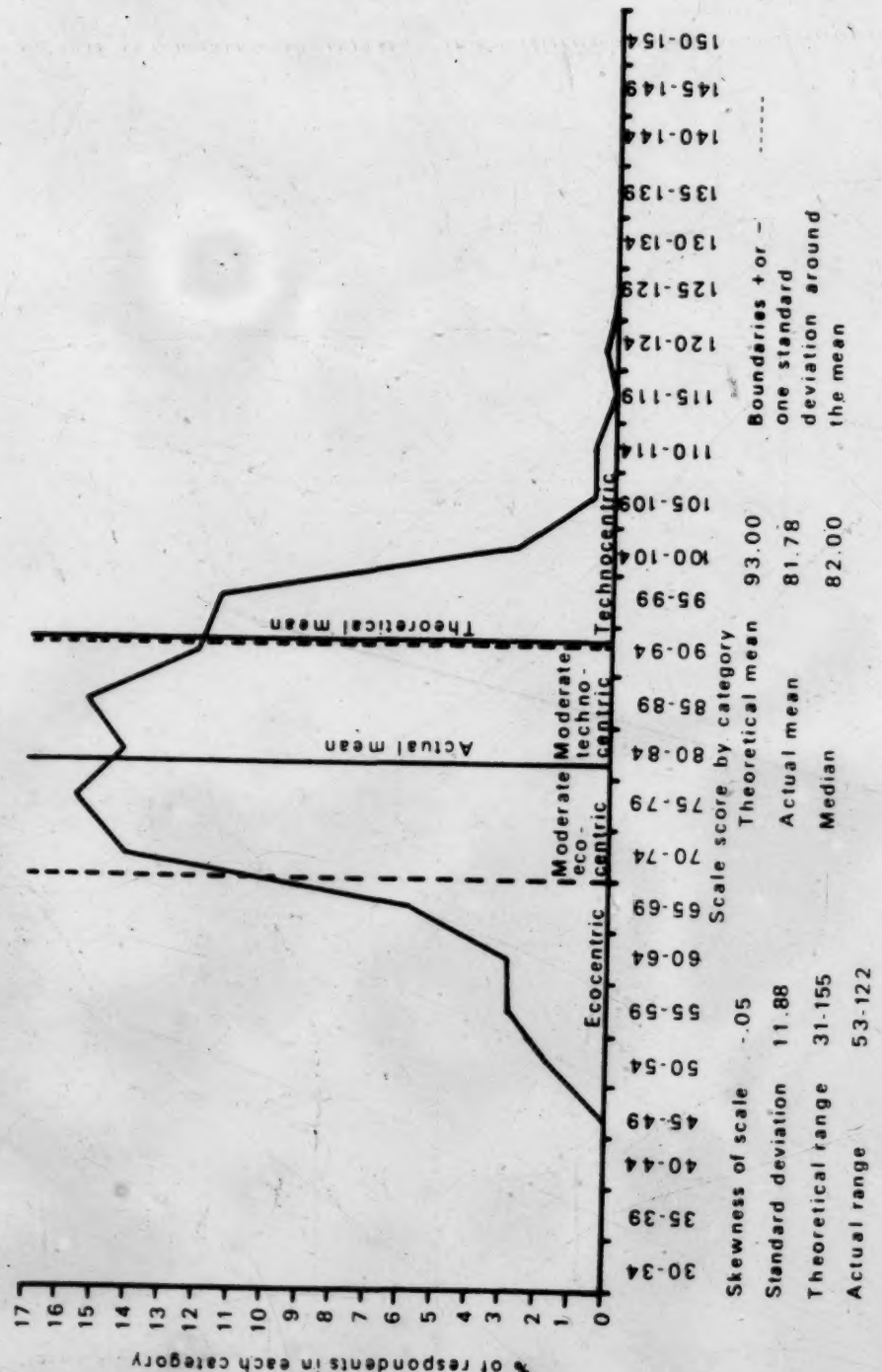


TABLE 4.3
COMBINED ATTITUDES SCALE: MEAN SCORES FOR ATTITUDE STATEMENTS

Statement	Mean	Orientation according to combined scale				F	p<
		Ecocentric 1	2	3	Technocentric 4		
11O, The economy should stop growing	3.98	3.56	3.75	3.96	4.28	5.92	0.0001
11C, Raise standard of living through science and technology	3.85	3.22	3.69	4.12	4.16	12.00	0.0001
11F, Economic growth improves the quality of life	3.51	2.53	3.45	3.67	4.09	17.16	0.0001
11S, Technology is the key to the future	3.30	2.59	3.12	3.55	3.74	13.36	0.0001
11H, Benefits of growth outweigh the consequences	3.24	2.41	3.10	3.51	3.60	16.02	0.0001
1A, No threat of an oil or gas shortage	3.14	2.50	2.92	3.46	3.47	7.19	0.0002
1C, Solving problems is best left to experts	3.02	2.25	2.69	3.34	3.65	11.66	0.0001
11M, Teach children about nature	2.96	2.56	2.82	3.06	3.35	5.08	0.002
1J, Individuals should buy solar and wind devices	2.81	2.47	2.64	2.92	3.19	4.63	0.004
11T, Approaching the limit to world population	2.81	2.12	2.62	3.01	3.32	10.26	0.0001
11A, No limits to standard of living	2.78	2.09	2.53	3.12	3.21	10.44	0.0001
11K, Science and technology harmful	2.74	2.19	2.48	2.96	3.28	11.80	0.0001
11N, Cannot count on science and technology	2.73	2.06	2.66	2.88	3.07	6.78	0.0003
11I, Humans modify the environment	2.72	1.59	2.60	2.91	3.44	20.99	0.0001
1I, Operate nuclear power plants without threatening the environment	2.67	1.75	2.28	3.12	3.33	20.66	0.0001
11P, Mankind rules over nature	2.61	1.90	2.41	2.71	3.23	9.74	0.0001
11V, There are limits to growth	2.59	1.94	2.45	2.59	3.35	19.14	.0001
11D, Plants and animals exist for humans	2.57	1.91	2.28	2.73	3.35	1.58	0.0001

TABLE 4.3 (continued)
COMBINED ATTITUDES SCALE: MEAN SCORES

Statement	Mean	Orientation according to combined scale				F	p<
		Ecocentric 1	2	3	Technocentric 4		
1M, Environmentalists interfere in energy projects	2.46	1.53	2.15	2.63	3.44	30.95	0.0001
1E, Environmental quality may have to be sacrificed	2.42	1.40	2.21	2.64	3.14	18.57	0.0001
1K, Nuclear the best way to meet future energy needs	2.41	1.46	2.25	2.70	2.95	23.70	0.0001
11L, Interference in nature produces disastrous consequences	2.33	1.78	2.19	2.44	2.81	9.05	0.0001
1H, Energy costs must be kept down	2.32	1.50	2.01	2.49	3.21	26.23	0.0001
11W, Economic growth is bad	2.24	1.62	2.06	2.29	2.93	22.18	0.0001
1D, The solution is to develop renewable sources of energy	2.16	1.94	1.97	2.27	2.51	4.82	0.003
11R, Humans need not adapt to the environment	2.13	1.53	1.95	2.17	2.84	21.71	0.0001
11U, Mankind abusing the environment	2.05	1.50	1.80	2.17	2.77	18.37	0.0001
1B, Include the cost of environmental damage	2.03	1.87	1.88	2.12	2.30	1.89	N.S.
1L, Moderation in consumption at the individual level	1.84	1.63	1.70	1.96	2.05	3.00	0.03
11G, Balance of nature easily upset	1.83	1.47	1.65	1.97	2.19	7.44	0.0002
11E, Humans must live in harmony with nature in order to survive	1.62	1.31	1.41	1.73	2.07	9.85	0.0001

TABLE 4.4
SOCIO-DEMOGRAPHIC VARIATIONS IN ATTITUDES (COMBINED SCALE)

Socio-demographic variables	Mean-score	F	p<
A. Sex			
Male	2.64	3.25	N.S
Female	2.42		
B. Age			
<25	2.45	1.20	N.S.
26-45	2.48		
>45	2.66		
C. Income			
<$15,000	2.67	0.56	N.S.
$15,000-$30,000	2.65		
$30,000-$45,000	2.41		
$45,000-$60,000	2.66		
>$60,000	2.55		
D. Education			
Up to Secondary	2.70	2.11	N.S.
Post Secondary to Some University	2.61		
At Least a University Graduate	2.39		

V. PERCEPTIONS OF CONSERVATION AND PREFERENCES FOR ENERGY

A. PERCEPTIONS OF CONSERVATION

To determine the public's evaluations of the importance of conservation, respondents were asked: "How important do you feel it is that individuals like yourself make an effort to cut down the amount of energy that they use?" From the four available "importance" options, 62.7% of the sample poputation felt that individual conservation was "very important", compared to 32.2% who felt that it was "somewhat important". The remaining 5% of the sample felt that individual conservation was "not at all important" or "not too important". To prevent data fragmentation, those options receiving minimal support were collapsed into the "somewhat important" category. For analysis, the sample was divided into the 62.7% who felt that individual conservation was "very important" compared to the 37.3% who felt that it was "not very important".

The survey also analysed respondents' evaluations of themselves as conservers. Nearly 48% of the sample claimed that they were "more conservation minded" than their peers, while approximately 47% described themselves as "the same" as others. Since only 5.0% of the sample chose the "less conservation minded" option, this was collapsed into the "same" category to prevent data fragmentation. Thus 52.3% felt they were "the same" or "less conservation minded" than their contemporaries.

B. PREFERENCES FOR ENERGY OPTIONS

The public's expectations of and preferences for energy resource options were analysed in several ways. Respondents were asked to select, from a list of potential energy sources, the two options which they felt *would be* the main sources of energy in Alberta in the year 2000, and the two which they would *prefer to see* as providing the bulk of Alberta's energy requirements. Respondent support for each option as an expectation and as a preference is presented in Table 5.1. In respect to energy source expectations, natural gas received the most

TABLE 5.1
EXPECTATIONS AND PREFERENCES FOR ENERGY RESOURCES IN ALBERTA IN THE YEAR 2000

Energy Roesource	Expectation		Preference		Change	
	%	Rank	%	Rank	%	Rank
Natural Gas	66.2	1	53.8	1	-12.4	0
Oil	33.5	2	14.2	5	-19.3	-3
Solar Energy	27.7	3	51.2	2	+23.5	+1
Coal for Electricity	23.8	4	10.8	6	-13.0	-2
Hydro-electric	20.4	5	31.9	3	+11.5	+2
Nuclear Power	13.1	6	6.5	7	-6.6	-1
Wind Power	5.0	7	19.6	4	+14.6	+3
Coal	4.6	8	2.7	9	-1.9	-1
Biomass Fuels	1.5	9	4.6	8	+3.1	+1

support, with oil ranking second. This was not surprising considering the dependence of Alberta and Canada on these options. Solar energy, coal for electricity generation, and hydro-electric power were ranked 3rd, 4th, and 5th respectively. The options which received minimal support included nuclear power, wind, coal, and biomass fuels. The lack of support for the coal and nuclear power options may be partially explained by the social and environmental concerns associated with these options (Farhar et al., 1980; Melber, 1983). The low profile of biomass fuels and wind power in the media and resources literature may partially explain their lack of support among the public.

When asked for their energy resource preferences rather than their expectations, the public chose natural gas as the most preferred option (53.8%). This was not surprising considering the enormous reserves of this resource in Alberta. Solar now ranked 2nd with 51.2% of sample support, while hydro-electric's ranking improved from 5th to 3rd and wind's from 7th to 4th. Public support also increased for biomass fuels; however, this still remained at a low level (4.6%). Support for all of the fossil fuel options decreased. For example, natural gas dropped by over 12 percentage points, oil by 19.3 percentage points, coal for electricity by 13 percentage points, and coal by 1.9 percentage points. Further, some reduction in public support was apparent for nuclear power. These results suggest a dichotomy between respondents'

expectations and their preferences. Though respondents expect to see fossil fuels as the major sources of energy in Alberta, they would prefer to see the development of renewable energy options such as solar or wind power.

Similar results were discerned in an interrelated though distinct section of the questionnaire. Here respondents were asked to evaluate seven energy options in the national context and to indicate their short and long run preferences (Table 5.2). The mean-scores obtained for each complete frequency distribution plus the percentage of the total survey who felt each energy option was either "excellent", or "very good" and "excellent" combined, are presented in section A of Table 5.2. Mean-scores, percentage support and rankings were used to indicate the absolute and relative support for the various options. Using the measure of mean-scores, oil and natural gas (3.54) was ranked the highest (as in Table 6.1), while energy conservation (3.49) and solar energy (3.27) were ranked second and third. Coal (2.76) and nuclear power (2.24) were seen as less appropriate energy options. Four of the seven energy resource options (oil and natural gas, conserving energy, solar energy, and oil from tar sands) received considerably more support as being either "excellent" or "very good" and "excellent", than the other three alternatives. In fact in the "very good" and "excellent" category there was only a 3.8 percentage point spread between the top four options. This was only marginally increased to an 8.5 percentage point spread in the "excellent" category. This suggests that the public supports a series of energy options, rather than a single dominant one. Those energy sources to receive minimal support in the "very good" and "excellent" categories were coal, biomass fuels, and nuclear power, which were ranked 5th, 6th, and 7th respectively. To synthesise, respondents tend to support environmentally benign sources of energy such as solar and conserving energy, while at the same time defending the traditional (oil and natural gas) and potential (tar sands) energy bases so important to Alberta's economy. This situation is clearly reflected when sections B and C of Table 5.2 are analysed.

With respect to options most preferred for the short run, oil and natural gas again received the most support. Conserving energy and oil from tar sands were ranked 2nd and 3rd.

TABLE 5.2
EVALUATIONS AND PREFERENCES FOR VARIOUS ENERGY RESOURCE OPTIONS FOR CANADA

A. Ratings	Mean-score		Excellent		Very Good And Excellent	
	Score	Rank	%	Rank	%	Rank
Oil and Natural gas	3.54	1	16.3	4	51.4	1
Conserving Energy	3.49	2	21.6	3	48.1	3
Solar Energy	3.27	3	24.8	1	47.6	4
Oil from Tar Sands	3.14	4	22.7	2	51.4	1
Biomass Fuels	3.04	5	7.0	6	19.5	6
Coal	2.76	6	9.7	5	24.3	5
Nuclear Power	2.24	7	5.2	7	16.9	7

B. Best Short Run Option	%	Rank
Oil and Natural Gas	39.0	1
Conserving Energy	22.5	2
Oil from Tar Sands	17.3	3
Coal	9.2	4
Solar Energy	7.6	5
Biomass Fuels	3.2	6
Nuclear Power	1.2	7

C. Best Long run Option	%	Rank
Solar Energy	37.2	1
Conserving Energy	16.0	2
Oil from Tar Sands	14.0	3
Oil and Natural Gas	11.6	4
Nuclear Power	8.8	5
Biomass Fuels	7.2	6
Coal	5.2	7

Solar energy and biomass fuels were ranked 5th and 6th respectively, while coal and nuclear power were ranked 4th and 7th.

When long run preferences were analysed solar energy was ranked first with 37.2% of respondents choosing this option. Conserving energy was ranked second with 16.0% of respondent support. The fossil fuel options of oil and natural gas, tar sands, and coal, which had received over 65% of respondent support as short run options, now received only approximately 31% of survey support and were ranked 3rd, 5th and 7th respectively. Nuclear

power improved its ranking of 7th in the short run to 5th as a long run option. Despite this, only 8.8% of the sample population felt it was the best long-run option. A trend from short-run support for the traditional fossil fuels to support for solar energy in the long run seems apparent (Table 5.2).

For purposes of analysis and following a policy adopted by Jackson (1985a, 1985b, 1985c), the seven energy options were classified according to the hard versus soft path dichotomy in the following manner: "soft path" (conserving energy, solar energy, and biomass fuels); "hard path" (oil and natural gas, oil from tar sands, coal, and nuclear power; Table 5.3). Here 66.7% of respondents chose the hard energy path in the short run, while support dropped to 39.6% in the long run. The reverse trend was the case for the soft energy path, where 33.3% of respondents chose a soft path option in the short run compared to 60.4% who chose one in the long run.

TABLE 5.3
SHORT AND LONG RUN PREFERENCES FOR HARD AND SOFT PATHS

Energy Paths	Short Run Preferences		Long Run Preferences	
	F	%	F	%
Hard Path	166	66.7	99	39.6
Soft Path	83	33.3	151	60.4
Totals (n)	(249)	100.0	(250)	100.0

The apparent shift in respondent support from the hard energy path to the soft energy path, as longer time horizons were envisaged, may indicate a difference between what the public expects to see in the short run and what they would prefer to see as the basis for energy provision in the long term. This supports the results obtained from the analysis of respondents' expectations and preferences for energy resource options in an earlier section of this chapter (Table 5.1). Their expectations were oriented towards the hard path options of natural gas, oil,

and coal, while respondents' preferences suggested a desire for soft energy options such as solar and wind. These results are consistent with those obtained in other studies (Brady, 1980; Harris, 1978).

C. SOCIO-ECONOMIC VARIATIONS IN EVALUATIONS OF AND PREFERENCES FOR ENERGY CONSERVATION AND RESOURCE USE

To determine if respondents' evaluations and preferences for energy conservation and resource use were influenced by their socio-economic characteristics, a series of crosstabulations was run. These analysed the interrelationships between socio-economic variables and:

1. perceptions of energy conservation (Table 5.4).
2. expectations and preferences for energy resource options (Table 5.5).
3. evaluations and preferences for short and long run energy resource options (Table 5.6).

TABLE 5.4
SOCIO-ECONOMIC VARIATIONS IN THE PERCEPTION OF CONSERVATION

	Sex	Age	Income	Education
Conservation Mindedness	N.S.	N.S.	.05	.0003
Importance of Conservation	.002	N.S.	N.S.	.002

From a total of 116 cross-tabulations there were only 21 significant relationships, which suggests that while some specific interrelationships did exist, on the whole there was no consistent relationship between respondents' socio-economic characteristics and their evaluations and preferences. Accepting this, there was no need to control for these in any subsequent analysis.

TABLE 5.5

CROSS TABULATIONS: SOCIO-ECONOMIC VARIATIONS IN LONG TERM EXPECTATIONS AND PREFERENCES

Energy Options	Sex		Age		Income		Education	
	Expect[1]	Pref[2]	Expect	Pref	Expect	Pref	Expect	Pref
Oil	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	.02	N.S.
Coal for domestic use	*[3]	*	*	*	*	*	*	*
Natural gas	N.S.	N.S.	.0001	.003	.006	N.S.	.004	N.S.
Hydro-electric Power	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Nuclear Power	N.S.	N.S.	.002	N.S.	N.S.	*	N.S.	N.S.
Coal for Electricity	.002	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Solar Energy	.0005	N.S.	N.S.	N.S.	N.S.	N.S.	.04	N.S.
Wind Energy	N.S.	N.S.	.0005	.002	N.S.	N.S.	.05	N.S.
Biomass Fuels	*	*	*	*	*	*	*	*

[1] Expect = Expectations for energy resource provision.
[2] Pref = Preferences for energy resource options.
[3] * = Insufficient numbers in each cell to permit analysis.

TABLE 5.6
SOCIO-ECONOMIC VARIATIONS IN EVALUATIONS AND PREFERENCES FOR ENERGY RESOURCE OPTIONS

	Sex P<	Age P<	Income P<	Education P<
A. Energy Specific				
Coal	N.S.[1]	.004	N.S.	N.S.
Conserving Energy	N.S.	N.S.	•[2]	N.S.
Oil and Natural Gas	N.S.	N.S.	N.S.	N.S.
Solar Energy	.03	N.S.	N.S.	N.S.
Biomass Fuels	N.S.	•	N.S.	N.S.
Nuclear Power	N.S.	N.S.	N.S.	N.S.
Oil from Tar Sands	.05	N.S.	•	N.S.
B. Hard Versus Soft Paths				
Best Short Run Option	N.S.	N.S.	N.S.	N.S.
Best Long Run Option	.04	.004	N.S.	N.S.

[1] N.S.= Not significant.
[2] •= Insufficient numbers in each cell to permit analyis.

D. PERCEPTIONS OF CONSERVATION AND ENVIRONMENTAL ATTITUDES

Interrelationships between respondents' perceptions of themselves as conservers, and their viewpoints on the importance of energy conservation were analysed in respect to their environmental attitudes (Table 5.7). A significant relationship was found between conservation-mindedness and environmental attitudes. The results show that while less than half of the population (47.7%) claimed they were "more conservation minded", ecocentrists were more likely than techocentrists to describe themselves in such a manner (78.1% compared to 34.9%). Similar findings where obtained when links between the perceived importance of individual conservation and environmental attitudes were examined. While 62.2% of all respondents felt that energy conservation was "very important", ecocentrists (78.9%) were more supportive of such a position than technocentrists (41.9%). To synthesise, while the public recognises the importance of conservation, this position is stronger among ecocentrists than among technocentrists.

TABLE 5.7
THE INFLUENCE OF ENVIRONMENTAL ORIENTATION ON CONSERVATION MINDEDNESS AND THE IMPORTANCE OF ENERGY CONSERVATION

	Orientation According To Environmental Scale				Total
	Ecocentric			Technocentric	
	1	2	3	4	
	%	%	%	%	%
A. Conservation Mindedness[1]					
More Conservation Minded	78.1	48.8	41.0	34.9	47.7
Less or about the Same	21.9	51.2	59.0	65.1	52.3
Totals (n)	(32)	(84)	(78)	(43)	(237)
B. Importance Of Conservation[2]					
Very Important	78.9	71.8	56.4	41.9	62.2
Not very Important	29.1	28.2	43.6	58.1	37.8
Totals (n)	(32)	(85)	(78)	(43)	(238)

[1] Chi-square=16.14; D.F.=3; P<.002
[2] Chi-Square=15.44; D.F.=3; P<.002

E. ENVIRONMENTAL ATTITUDES AND ENERGY RESOURCE PREFERENCES

Expectations of and Preferences for Energy Resource Options (Alberta)

Interrelationships between expectations and preferences for energy sources in Alberta (beyond the year 2000), and environmental attitudes were determined using crosstabulation analysis (Table 5.8). Here support for each option was determined according to whether respondents had mentioned that option in one of their two choices. The findings indicate no statistically signficant relationship between expectations of energy provision and environmental attitudes.

In respect to preferred energy sources, some statistically significant relationships were apparent. Though only five of the nine energy resource options had sufficient support from respondents to permit analysis, four of these (oil, natural gas, solar, and wind), exhibited

TABLE 5.8

LONG TERM EXPECTATIONS AND PREFERENCES IN RESPECT TO ENVIRONMENTAL ATTITUDE ORIENTATIONS

Energy Options	Orientation According To Combined Scale				X^1	p<
	Ecocentric 1 %	2 %	3 %	Technocentric 4 %		
A. Expected Energy Source						
Oil	25.0	32.9	34.6	41.9	2.39	N.S.
Coal for Domestic Use[1]	--	2.9	7.7	7.0	4.75	N.S.
Natural Gas	65.5	69.4	65.4	65.1	0.41	N.S.
Hydro-electric	21.9	22.4	20.5	18.5	0.27	N.S.
Nuclear Power	15.6	11.8	11.5	16.5	0.86	N.S.
Coal for Electricity	21.9	22.4	24.4	27.9	0.49	N.S.
Solar Energy	21.9	28.2	28.2	23.3	0.83	N.S.
Wind Energy [1]	12.5	3.5	5.1	--	6.86	N.S.
Biomass Fuels [1]	3.1	3.5	--	--	6.86	N.S.
B. Prefered Energy Source						
Oil	3.1	10.6	15.4	27.9	10.80	0.01
Coal for Domestic Use [1]	--	--	3.8	7.0	7.06	N.S.
Natural Gas	34.4	45.9	61.5	69.8	13.29	0.004
Hydro-electric	28.1	30.6	35.9	34.9	0.93	N.S.
Nuclear Power [1]	3.1	2.4	11.5	4.7	6.98	N.S.
Coal for Electricity [1]	3.1	11.8	10.3	18.6	4.51	N.S.
Solar Energy	81.3	62.4	41.0	23.3	32.44	0.0001
Wind Energy	37.5	25.9	10.3	9.3	16.01	0.001
Biomass Fuels [1]	3.1	8.2	5.1	--	4.34	N.S.

[1] Insufficient numbers of respondents in each cell to permit statistical analysis.

significant relationships. These supported the theoretical contention that technocentrists would favour hard path options, while ecocentrists would choose the soft path options. Technocentrists were more supportive of natural gas (69.8%) and oil (27.9%), as a preferred energy option than were ecocentrists (34.4% and 3.1% respectively). Ecocentrists' support for soft energy options such as solar energy (81.3%) and wind power (37.5%) was higher than technocentrists' support for the same options (solar 23.3%; wind 9.3%)

Overall Evaluations and Preferences for Energy Resource Options (Canada)

Results comparable to those found in the "expectations" versus "preference" analysis were determined when respondents' evaluations of energy resource options were analysed. Mean scores were computed for the seven energy options according to the respondents' environmental attitudes (Table 5.9). Significant relationships between attitude orientation and evaluations of energy resource options for five of the seven available energy options were discerned. For example, ecocentrists evaluated conserving energy (3.94), solar energy (3.53), and biomass fuels (2.77) more highly than technocentrists (conserving energy, 3.08; solar energy, 3.00; biomass fuels, 2.23). In respect to the hard energy options such as oil and natural gas, and especially nuclear power, the reverse was the case; here technocentrists rated these options more highly than ecocentrists.

Short-run and Long-run Preferences for Energy Resource Options

Interrelationships between environmental attitudes and short-run energy choices for the seven specific energy options were analysed (Table 5.10). No significant relationship was found between environmental attitude position and best short-run energy options; however, some trends were apparent at the ecocentric/technocentric extreme. Nearly twice as many ecocentrists (28.1%) as technocentrists (14.3%) chose conserving energy, while ecocentrists' support for oil from tar sands was 22 percentage points less than that reported for the technocentrists (6.3% and 28.6% respectively).

TABLE 5.9

MEAN SCORES: THE INFLUENCE OF ENVIRONMENTAL ATTITUDE ORIENTATION ON ENERGY EVALUATIONS

Energy Options	Mean	Orientation According To Combined Scale				F	p<
		Ecocentric 1	2	3	Technoentric 4		
Oil and Natural Gas	3.53	3.10	3.44	3.64	3.88	5.06	0.002
Conserving Energy	3.51	3.94	3.73	3.28	3.08	6.67	0.0003
Oil from Tar Sands	3.49	3.06	3.44	3.68	3.58	2.29	N.S.
Solar Energy	3.31	3.53	3.58	3.05	3.00	3.30	0.02
Coal	2.74	2.38	2.67	2.83	3.02	2.20	N.S.
Biomass Fuels	2.54	2.77	2.85	2.27	2.23	4.34	0.006
Nuclear Power	2.21	1.48	1.97	2.48	2.79	10.86	0.006

TABLE 5.10
ENVIRONMENTAL POSITION AND PREFERENCES FOR SHORT-RUN ENERGY OPTIONS

Preferred Energy Options And Paths	Orientation According To Combined Scale Ecocentric 1 %	2 %	3 %	Technocentric 4 %	Total n	%
A. Specific Options[1]						
Oil and Natural Gas	46.9	36.6	36.0	45.2	91	39.4
Conserving Energy	28.1	25.6	22.7	14.3	53	22.9
Oil from Tar Sands	6.3	18.3	13.3	28.6	39	16.9
Solar Energy	9.4	4.9	13.3	2.4	18	7.8
Coal	3.1	8.5	12.0	7.1	20	8.7
Biomass Fuels	6.3	3.7	2.7	2.4	8	3.5
Nuclear Power	-	2.4	-	-	2	0.9
B. Paths[2]						
Soft Path	43.8	34.1	38.7	19.0	79	34.2
Hard Path	56.3	65.9	61.3	81.0	152	65.8
Totals (n)	(32)	(82)	(75)	(42)	(231)	100.0

[1] Chi-square=21.79; D.F.=18; N.S.
[2] Chi-square=6.24; D.F.=3; N.S.

When short run choices were collasped into the hard/soft path dichotomy, ecocentrists (43.8%) were found to be more supportive of the soft path than technocentrists (19.0%); the reverse was the case for hard path support. Again, however, these differences, though consistent with the basic assumption of the thesis and with results of other studies (Jackson, 1985a), were not statistically significant.

In respect of long run energy choices there was no significant relationship between specific options and environmental attitude orientation (Table 5.11); however, some trends were apparent. For example, ecocentrists were more supportive of conserving energy (25%), and solar energy (40.6%) than technocentrists (9.5% and 33.3% respectively). By contrast, more technocentrists chose oil and natural gas, oil from tar sands, coal, and especially nuclear power than ecocentrists.

TABLE 5.11
ENVIRONMENTAL POSITION AND PREFERENCES FOR LONG-RUN ENERGY OPTIONS

Preferred Energy Options And Paths	Orientation According To Combined Scale Ecocentric 1 %	2 %	3 %	Technocentric 4 %	Total n	%
A. Specific Options[1]						
Oil and Natural Gas	9.4	4.9	17.3	14.3	26	11.3
Conserving Energy	25.0	19.5	16.0	9.5	40	17.3
Oil from Tar Sands	9.4	12.2	14.7	19.0	32	13.9
Solar Energy	40.6	45.1	28.0	33.3	85	36.8
Coal	3.1	4.9	5.3	9.5	13	5.6
Biomass Fuels	9.4	9.8	6.7	-	16	6.9
Nuclear Power	3.1	3.7	12.0	14.3	19	8.2
B. Paths[2]						
Soft Path	75.0	74.4	50.7	42.9	141	61.0
Hard Path	25.0	25.6	49.3	57.1	90	39.0
Totals (n)	(32)	(82)	(75)	(42)	(231)	100.0

[1] Chi-square=25.59; D.F.=18; N.S.
[2] Chi-square=18.00; D.F.=3; P<.0005

When such choices were aggregated to the hard and soft paths, a statistically significant relationship between energy preference and environmental attitudes was apparent. Seventy-five per cent of ecocentrists, compared to 42.9% of technocentrists, chose a soft path option. By contrast, more than twice as many technocentrists chose the hard energy path than ecocentrists.

F. CONCLUSION

The results presented in this chapter suggest a change in the public's evaluations and preferences for energy resource options, from an acceptance of hard energy paths in the immediate future, towards a desire for soft energy paths in the long term. Further, these evaluations and preferences may be partially explained with reference to fundamental attitudes

and beliefs. The specific findings may be summarised as follows:

1. In respect to the degree of conservation mindedness and attitude orientation, ecocentrists tended to be more conservation minded than technocentrists.
2. Similar results were apparent between the importance of energy conservation and attitude orientation. Specifically more ecocentrists than technocentrists felt conservation was very important.
3. When respondents' expectations of energy resource provision in Alberta were analysed it was the traditional fossil fuel options such as natural gas and oil that people expected to see providing Alberta's energy requirements. However, there were no statistically significant relationships between respondents' environmental attitudes and their energy resource expectations.
4. By contrast, when respondents' preferences for energy resource provision were analysed, solar energy received considerable support. Further the less traditional sources of power such as hydro-electric and wind were also seen as appropriate options. Some statistically significant relationships were apparent between environmental attitudes and energy resource preferences. Specifically ecocentrists were more supportive of the soft energy options than technocentrists, while technocentrists were more supportive of the hard energy options than ecocentrists.
5. When short term preferences for hard and soft energy paths were analysed, no significant relationships were discerned between energy preferences and environmental attitudes.
6. When long term preferences for hard and soft energy paths were analysed, strong relationships were discerned: ecocentrists more frequently chose the soft path, while technocentrists more frequently chose the hard path.

The fact that socio-economic variables failed to explain any significant variation in evaluations and preferences indicates that the measurement of fundamental attitudes and beliefs provides a more useful explanation of variations in the the public's evaluations and preferences.

To conclude, though environmental attitude orientation failed to explain variations in energy choice in the short run, and relationships were indeterminate in the long run, when these options were collapsed into the soft/hard path dichotomy, significant variations were apparent. These results are consistent with the conclusions drawn from the analysis of long-term expectations versus preferences for energy resource options undertaken earlier in this chapter, and with the analysis of attitudinal variations in perceptions of conservation. Further they are compatible with results reported by Jackson (1985a, 1985b, 1985c).

The results also suggest the presence of constraints influencing the public's preferences. The shift from the hard to soft energy paths as long-term time horizons are envisaged may indicate a major difference between what people tend to accept for today and what they would prefer to see for the future. The economic, political, and social institutions prevalent today are supportive of hard path options (Commoner, 1976; Lovins, 1977), thus even ecocentric respondents may choose those energy options consistent with the present *status quo*. When these constraints are removed by providing respondents with the opportunity to indicate their long term energy preferences rather than their expectations, the public tends to be more supportive of the soft energy path.

VI. CONSERVATION BEHAVIOUR AND ENVIRONMENTAL ATTITUDES

A. INTRODUCTION

It was shown in the previous chapter that environmental attitudes exerted an influence on respondents' perceptions of and preferences about various aspects of the energy issue. It is now necessary to examine the extent to which attitudes were also translated into behaviour, as measured by respondents' awareness and adoption of energy conservation practices.

B. AWARENESS AND ADOPTION OF CONSERVATION PRACTICES

To elicit awareness and adoption of conservation practices, the respondents were asked to complete two open-ended questions (Questions 4 and 5, Appendix A). From the 260 completed questionnaires respondents listed 68 distinct types of conservation practice. These ranged from "turning off lights" to "building energy efficient houses". To prevent data fragmentation the 68 types of practice were aggregated to form eight separate categories (Table 6.1). The selection criteria for these were:

1. Similar conservation practices were grouped together;
2. Conservation practices with similar cost requirements were grouped together;
3. Categories were designed to generate a viable number of responses to permit analysis.

Where possible, the requirements of all three criteria were satisfied; however, in some cases this proved impossible. For instance, in category 3 (alternative house design) criteria 1 and 2 were satisfied but the absolute number of responses (21) meant that the data were too fragmented to permit analysis. Data were retained in a disaggregated form (68 different types) for correlation analysis, and only aggregated to the 8 categories to prevent data fragmentation in cross-tabulation analysis.

TABLE 6.1
CLASSIFICATION OF CONSERVATION BEHAVIOURS

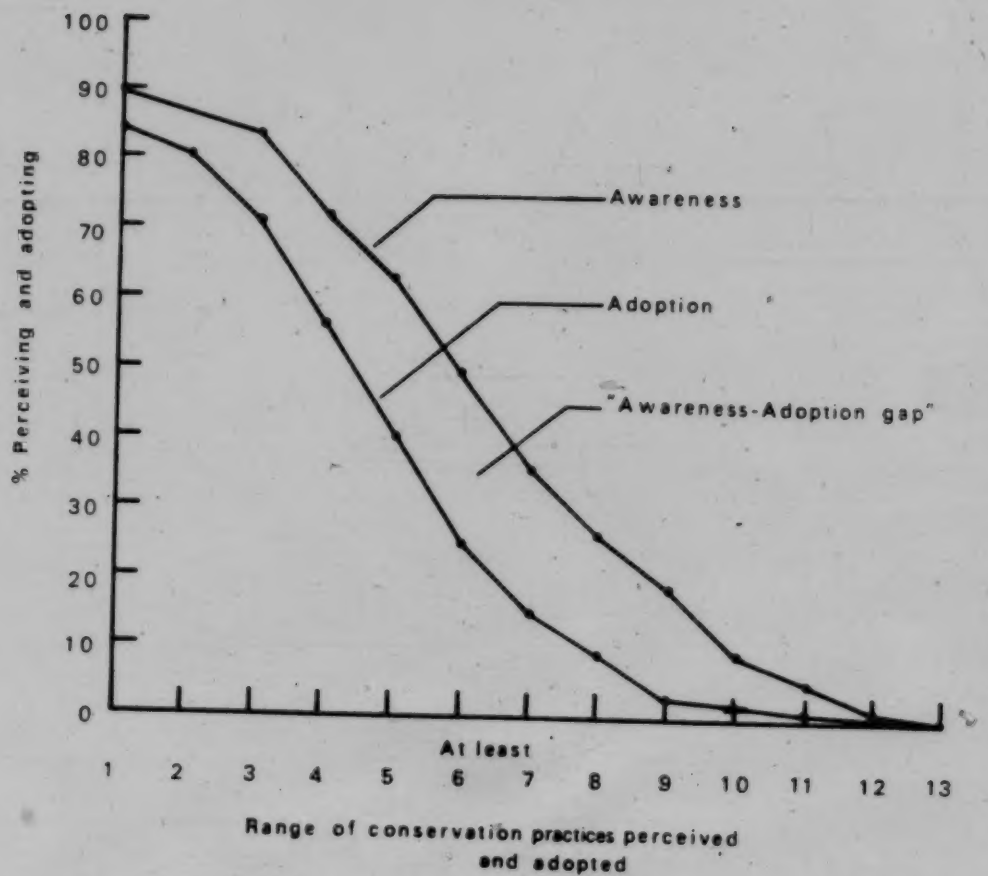
Category	Specific examples
1. Energy loss prevention	Weather proofing; storm doors; window and ceiling insulation; double glazing; servicing the heating system; cleaning filters.
2. Reduction of energy use	Turning down thermostat; regulate thermostat; reduce air filtration; conserve use of all forms of energy; use energy at off peak times; don't use air conditioners; better heating systems; recycling; alternative fuels.
3. Alternative house design	Solar houses; purchase energy efficient houses; reduce air leakage through the building envelope.
4. Efficient use of water	Take showers; shorter showers; cold baths; lower water level; better plumbing.
5. Efficient use of appliances in the kitchen	Better use of dishwasher and washing machines (full loads, shorter cycles, air dry); alternative cooking; barbeque instead of oven.
6. Efficient use of appliances in the house	Turn off the lights; turn off T.V., stereos, radios; maintain appliances; cut back on use of appliances.
7. Use of and type of car	Use smaller cars; drive less powerful cars; run one car; lower speed limit; live closer to work; don't leave car engines running; less use of block heating system.
8. Alternative transportation	Use public transportation; bicycle; walk; car pool.

Frequency distributions

89.2% of the sample claimed awareness of at least 1 conservation practice (Figure 6.1), with nearly 50% of the sample listing at least 6 distinct types of practice. Not surprisingly, there was an inverse relationship between the frequency of awareness and the total percentage of the population claiming knowledge of such practices. No respondent was aware of more than 12 conservation practices, a figure considerably less than the 68 types of adjustments listed by the total sample. This corresponds to behaviour reported by Jackson (1980a), and to findings from

FIGURE 6.1

THE AWARENESS/ADOPTION GAP



Mean number of conservation practices listed = 5.4

Mean number of conservation practices adopted = 3.9

natural hazard research (Slovic et al., 1974), namely that no-one is aware of the full range of alternatives.

In respect to the adoption of conservation practices, 84.2% of the sample claimed to have adopted at least one conservation practice (Figure 6.1). Again, the percentage of the population claiming adoption decreased as the frequency of adjustments increased. Only 25% of the sample claimed to have adopted 6 or more conservation practices. No respondent listed more than 12 adjustments, and less than 10% of the sample claimed adoption of 8 or more practices.

A significant difference was apparent between the percentage of the population stating awareness and that claiming adoption. Specifically, the range of adjustments adopted was narrower than the range perceived. The mean number of adjustments adopted (3.9) was significantly less than the average number listed (5.4). For a respondent to adopt a conservation practice, that individual must be aware of such a practice; however, awareness does not guarantee adoption. This supports Jackson and Foster's contention that "awareness is a necessary but not a sufficient pre-condition for the adoption of conservation practices" (Jackson and Foster, 1982, p.15). Potential reasons for the existence of an adoption/awareness gap relate to technological and regulatory constraints (Karns and Khera, 1983) or financial constraints (Jackson, 1980a; McDougall et al., 1979). For example, while most respondents accept the desirability of conservation (Chapter 5), they may often find the cost of appropriate practices to be prohibitive.

To understand more clearly the reasons for the awareness/adoption gap, the 68 types of conservation practices listed by respondents were collapsed into 8 categories (Table 6.2). Frequencies obtained from these suggest some important results. For awareness, over 96% of the sample were aware of at least one energy reduction practice in category 2 (reduction of energy use). A majority of respondents (at least 63%) were also aware of at least one conservation practice in categories 1 and 6 (energy loss prevention and efficient use of appliances in the house), while between 25% and 38% of the sample were aware of a

TABLE 6.2
AWARENESS AND ADOPTION OF AT LEAST ONE CONSERVATION PRACTICE: BY CATEGORY

Conservation practice	Awareness n	Awareness %	Rank	Adoption n	Adoption %	Rank
1. Energy loss prevention	170	65.4	2	132	50.8	3
2. Reduction of energy use	249	96.8	1	193	74.2	1
3. Alternative house design	18	6.9	8	3	1.2	8
4. Efficient use of water	65	25.0	7	48	18.5	7
5. Efficient use of appliances in the kitchen	82	31.5	6	63	24.2	5
6. Efficient use of appliances in the house	166	63.8	3	14.7	56.8	2
7. Use of and type of car	100	38.4	4	72	27.6	4
8. Alternative transportation	96	36.9	5	62	23.8	6

conservation practice in categories 4 (efficient use of water), 5 (efficient use of appliances in the kitchen), 7 (use of and type of car), and 8 (alternative transportation). Significantly, the sample population tended to be unaware of category 3, where less than 7.0% of the sample listed "alternative house design" as a potential conservation measure. This may be partially explained by the highly prohibitive cost of such a practice.

In all categories a smaller percentage of the sample claimed to have initiated adjustments than those listing awareness; significantly, those behaviours that respondents tended to most frequently aware of were also the most frequently cited as having been adopted. As with awareness, more respondents claimed to have adopted categories 1,2, and 6 than the alternative types of conservation. Low economic and time costs may partially explain support for categories 2 and 6, while adoption of category 1 may be related to the high profile of this option amongst respondents. The prohibitive cost of category 3 may explain why only 1.2% of the sample claimed to have adopted such a conservation practice. These results are consistent with previous research findings (Jackson, 1980a; McDougall et al., 1979; Murray et al., 1974) and suggest a direct link between cost and frequency of adoption.

Consistencies between the degree of awareness and the level of adoption of conservation practices suggest a link between knowledge and behaviour. However, this link

seems tenuous considering the presence of the adoption/awareness gap and the influence of time and economic cost. One potential method for explaining variations in the public's awareness and adoption of conservation practices would be to analyse behaviour with reference to the individual's fundamental attitudes and beliefs or world views.

C. ENVIRONMENTAL ATTITUDES AND ENERGY CONSERVATION BEHAVIOUR

It may be argued that a number of direct relationships between respondents' attitudes and their awareness and adoption of conservation practices may be expected. Further, analysis of these links should prove more appropriate for explaining variations in behaviour than the traditional use of socio-economic variables. Specifically, it was anticipated that:

1. There would be an inverse relationship between the respondents' score on the attitudes scale and their awareness of conservation practices;
2. There would be an inverse relationship between respondents' score on the attitudes scale and their adoption of conservation practices;
3. Variations in respondents' awareness would more clearly be explained with reference to fundamental attitudes and beliefs than with reference to socio-economic variables;
4. Variations in the respondents' adoption of conservation practices would be more clearly explained with reference to fundamental attitudes and beliefs than with reference to socio-economic variables.

Zero Order And Partial Correlations

Having identified a number of hypothetical relationships between attitudes and behaviour, these could now be tested using zero order and partial correlations. For purposes of analysis, and based on other research findings (Assael and Day, 1968; Farhar et al., 1980; Fishbein, 1963; and Rosenberg and Hovland, 1960), it was assumed that environmentally based attitudes would have a direct influence on the awareness and adoption of conservation practices. Though evidence exists that actual behaviour may influence an individual's attitudes

(Winett and Ester, 1983), the purpose of this thesis was to study the influence of attitude on behaviour. Zero order correlations were used to analyse the direct relationship between attitude and behaviour, while in the partial correlations, potential socio-economic influences were controlled (Tables, 6.3 and 6.4). A negative relationship between (1) awareness of conservation practices and attitude and (2) adoption of conservation practices and attitude would be expected.

Awareness Of Conservation Practices and Environmental Attitudes

Results suggest that the awareness of conservation practices may be partly understood with reference to environmentally based attitudes. Further, such attitudes prove more appropriate in explaining variations in awareness than socio-economic variables. Though some variation in the sample's awareness of all energy conservation practices could be explained by the respondents' socio-economic characteristics, especially education (zero order coefficient .25) and income (zero order coefficient .26), this was significantly less than that explained by the combined scale (zero order coefficient -.39). Even when socio-economic variations were controlled, the partial coefficient (-.37) was only marginally smaller than the zero order coefficient.

Potential sub-variations in the relationship between attitudes and awareness of conservation behaviours were identified when the awareness of the 68 types of conservation practice was collapsed into 8 categories and the partial correlation analysis was rerun. For 7 of the 8 categories, the environmentally based attitudes scale provided a statistically significant, if only a weak explanation of variation in awareness. The 7 significant relationships were reduced to 6 when partial correlations were run (category 3, alternative house design was insignificant). The strongest relationships between the respondents' scale score and their awareness were in categories 2, reduced energy use (partial coefficient -.23), 5, efficient use of appliances in the kitchen (partial coefficient -.20), 6, efficient use of appliances in the house (partial coefficient -.24), and 8, alternative transportation (partial coefficient -.21) These practices were generally

TABLE 6.3
ZERO ORDER AND PARTIAL CORRELATIONS BETWEEN AWARENESS OF CONSERVATION PRACTICES, ATTITUDE SCALE AND SOCIO-ECONOMIC VARIABLES

Conservation practice	Combined Scale		Age	Sex	Education	Income
	Zero Order	Partial[1]				
Total awareness	-.39	(-.37)	-.06	.07	.25	.26
P<	.0001	.0001	N.S.	N.S.	.0001	.0001
Energy loss prevention	-.16	(-.16)	-.02	-.07	-.10	-.13
P<	.02	.02	N.S.	N.S.	N.S.	.04
Reduction of energy use	-.25	(-.23)	-.00	.09	.20	.14
P<	.0001	.002	N.S.	N.S.	.003	.03
Alternative house design	-.12	(-.08)	-.06	.07	.19	.09
P<	.05	N.S.	N.S.	N.S.	.004	N.S.
Efficient use of water	-.15	(-.15)	.07	.02	.02	.02
P<	.02	.02	N.S.	N.S.	N.S.	N.S.
Efficient use of appliances in the kitchen	-.23	(-.20)	-.04	.16	.06	.09
P<	.0001	.003	N.S.	.008	N.S.	N.S.
Efficient use of appliances in the house	-.26	(-.24)	-.14	.01	.07	.07
P<	.0001	.0001	.02	N.S.	N.S.	N.S.
Use of and type of car	-.08	(-.07)	-.06	-.04	.11	.22
P<	N.S.	N.S.	N.S.	N.S.	N.S.	.002
Alternative transportation	-.24	(-.21)	-.10	.12	.12	.18
P<	.0001	.0002	N.S.	.05	.05	.006

[1] Partial correlation; controlling for age, sex, education, and income.

known by the majority of the sample and relatively easy to initiate.

For some categories, socio-economic variables were found to explain more variation in respondent awareness than the attitudes scale. Respondents with a higher educational attainment tended to be more aware of the use of "alternative house design" (partial coefficient .19), than the less educated. Further, individuals from higher income brackets were more aware

of conservation practices associated with the "use of and type of car" (partial coefficient .22) than the less well off. Despite this, variations in the awareness of energy conserving practices were more appropriately understood with reference to environmental attitudes or world views than in respect to the respondents' socio-economic characteristics.

Adoption Of Conservation Practices and Environmental Attitudes

Similar though distinct relationships were discerned when variations in the adoption of energy conserving practices were analysed (Table 6.4). Again, the combined scale (zero order coefficient -.34) proved to be the most appropriate variable for explaning variations in the level of adoption of conservation adjustments reported by those surveyed. The partial coefficient (-.32) was only marginally smaller than the zero order coefficient when socio-economic variations were controlled.

The environmental attitudes scale provided a better explanation of variations in stated adoption of conservation practices than the more traditional use of socio-economic variables; however, there were important differences in the strength of relationships between attitudes and behaviour when the adoption of specific types of practice was analysed. In four of the eight categories, the combined scale provided a statisfically significant explanation of variation in the level adoption of adjustments. These included alternative transportation (partial coefficient -.30), efficient use of appliances in the kitchen (partial coefficient -.25), efficient use of appliances in the house (partial coefficient -.20), and reduction in the use of energy (partial coefficient -.19). In several of the other categories, education and income characteristics provided better explanations of variance. In these cases, the more educated and affluent claimed to have adopted a larger number of conservation practices than the less well off or educated. For instance, in category 1 the zero order correlations for income and education were .16 and .17 respectively, while the combined scale failed to explain any variation. Despite this, the use of the attitudes scale proved, overall, to be the most appropriate measure of variations in the adoption of conservation practices.

TABLE 6.4
ZREO ORDER AND PARTIAL CORRELATIONS BETWEEN ADOPTION OF CONSERVATION PRACTICES, ATTITUDE SCALE AND SOCIO-ECONOMIC VARIABLES

Conservation practice	Combined Scale		Age	Sex	Education	Income
	Zero Order	Partial[1]				
Total adoption	-.34	(-.32)	-.01	-.04	.24	.22
P<	.0001	.0001	N.S.	N.S.	.0001	.002
Energy loss prevention	-.05	(-.05)	.03	-.09	.17	.16
P<	N.S.	N.S.	N.S.	N.S.	.008	.01
Reduction of energy use	-.20	(-.19)	.03	.02	.18	.17
P<	.002	.005	N.S.	N.S.	.007	.007
Alternative house design	.07	(.05)	-.04	-.01	.13	.06
P<	N.S.	N.S.	N.S.	N.S.	.04	N.S.
Efficient use of water	-.10	(-.10)	.03	.04	.01	-.04
P<	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Efficient use of appliances in the kitchen	-.28	(-.25)	-.06	.19	.05	.08
P<	.0001	.0001	N.S.	.004	N.S.	N.S.
Efficient use of appliances in the house	-.23	(-.20)	-.15	.08	.08	.12
P<	.0001	.003	.02	N.S.	N.S.	.04
Use of and type of car	-.06	(-.06)	-.01	-.04	.15	.20
P<	N.S.	N.S.	N.S.	N.S.	.02	.003
Alternative transportation	-.30	(-.30)	-.09	.02	.02	.09
P<	.0001	.0001	N.S.	N.S.	N.S.	N.S.

[1] Partial correlation; controlling for age, sex, education, and income.

Crosstabulations

To analyse the specific characteristics of the relationship between attitudes and behaviour, the environmental attitudes scale was collapsed into the 4 attitude categories used previously (ecocentric to technocentric). Conservation practices were then analysed in respect to these categories using crosstabulation (Table 6.5). To prevent data fragmentation, the

frequencies of awareness and adoption of conservation practices were collapsed into 3 categories. For awareness, these were; (1) unaware, (2) aware of 1-6 practices, (3) aware of 7-12 practices. A similar classification scheme was used for stated adoption practices, namely (1) did not adopt, (2) adoption of 1-6 practices and (3) adoption of 7-12 practices.

Respondents' level of awareness was found to be significantly influenced by their environmental attitude orientation. While no ecocentrists, and only 3.5% of the moderate ecocentrists were unaware of at least one conservation practice, over 18% of the technocentrists were not aware of any. As expected, ecocentrists tended to be aware of a greater number of conservation practices than technocentrists. Though more technocentrists (67.4%) were aware of between 1-6 conservation practices than ecocentrists (46.9%), this position was reversed when respondents listing more than 6 conservation practices were analysed. Only 14% of the technocentrists, compared to over half of the ecocentrists, claimed awareness of between 7 and 12 adjustments.

A similar and significant trend was apparent from crosstabulations of attitude orientation and stated adoption. Again, no ecocentrist had failed to adopt at least one conservation practice, compared to nearly one quarter of technocentrists (23.3%). Though only 25% of ecocentrists stated that they had adopted between 7 and 12 conservation adjustments, this was still almost four times the comparable frequency reported for technocentrists (7%).

Interrelationships between environmental attitude orientation and specific types of conservation practices were analysed. To prevent data fragmentation, the awareness and adoption data were each collapsed into two groupings; aware and unaware; adopt and not adopt.

In 5 of the 8 awareness categories (numbers 1,2,5,6 and 8), there was a significant relationship between attitude orientation and awareness of conservation practices (Table 6.6). For all 5 categories more ecocentrists were aware of at least 1 conservation practice than technocentrists. For instance, 91% of ecocentrists claimed awareness of at least one "reduction of energy use" practices (category 2) compared to 61% of technocentrists. In category 5

TABLE 6.5
CROSSTABULATIONS: AWARENESS AND ADOPTION OF CONSERVATION PRACTICES IN RESPECT TO ATTITUDE ORIENTATION

	Orientation according to combined scale				Total
	Ecocentric			Technocentric	
	1 %	2 %	3 %	4 %	
A. Awareness[1]					
Unaware	--	3.5	14.1	18.6	
Aware, 1-6 practices	46.9	51.8	52.8	67.4	
Aware, 7-12 practices	53.1	44.7	33.3	14.0	
Totals (n)	(32)	(85)	(78)	(43)	(238)
B. Adoption[2]					
Not adopt	--	5.9	24.4	23.3	
Adopt, 1-6 practices	75.0	76.2	62.8	69.8	
Adopt, 7-12 practices	25.0	17.6	12.8	7.0	
Totals (n)	(32)	(85)	(78)	(43)	(238)

[1] Chi-square=24.05; D.F.=6; P<.0006
[2] Chi-square=22.49; D.F.=6; P<.002

TABLE 6.6
CROSSTABULATIONS[1]: AWARENESS OF CONSERVATION PRACTICE BY ATTITUDE ORIENTATION

Awareness	Orientation according to the combined scale				X^2	P<
	Ecocentric			Technocentric		
	1 %	2 %	3 %	4 %		
1. Energy loss prevention	65.6	83.5	60.3	46.5	20.24	..0003
2. Reduction of energy use	90.6	89.4	74.4	60.5	18.32	.0005
3. Alternative house design	9.4	11.8	2.6	4.7	5.84	N.S.
4. Efficient use of water	37.5	24.7	25.6	16.5	4.40	N.S.
5. Efficient use of appliances in the kitchen	56.3	34.1	26.9	18.6	13.31	.005
6. Efficient use of appliances in the house	71.9	78.8	57.7	51.2	13.33	.005
7. Use of and type of car	40.0	38.1	35.1	30.2	1.02	N.S.
8. Alternative transportation	59.4	43.5	33.3	25.6	10.62	.02

[1] Degrees of Freedom=3 in all cases

"efficient use of appliances in the kitchen", awareness among ecocentrists and technocentrists was 56.3% and 18.6% respectively. For 3 of the 5 significant relationships (categories 2,5, and 8), there was a consistency between the attitude orientation subdivision and degree of awareness. However, in category 1 (energy loss prevention) and category 6 (efficient use of appliances in the kitchen), a higher percentage of moderate ecocentrists claimed awareness of conservation practices than ecocentrists; despite this, awareness in both groupings was considerably higher than that reported for the two technocentric sub-orientations. No statistically significant relationship was found for categories 3 (alternative house design), 4 (efficient use of water), and 7 (use of and type of car).

Strikingly similar results were obtained when the adoption of conservation practices was analysed (Table 6.7). There was a significant relationship between attitude orientation and the adoption of energy conservation practices for 5 of the 8 categories. These were the same categories in which variations between attitude orientation and awareness had been identified. The most obvious variations were found in categories 2, 5, and 8. For instance, in category 8, 46.9% of ecocentrists claimed to have adopted at least one conservation practice compared to only 14% of technocentrists. No discernable relationships were found for three of the categories: alternative house design (3), efficient use of water (4), and use of and type of car (7).

D. CONCLUSION

The results presented in this chapter suggest a number of relationships between the awareness and the adoption of conservation practices. Further, links between attitudes and behaviour may be discerned. Specifically, respondents' awareness of conservation practices and their stated adjustments may be explained, at least in part, with reference to fundamental attitudes and beliefs. Direct relationships identified may be summarized as follows:

1. The vast majority of respondents were aware of and claimed to have adopted at least one conservation practice; however, no respondent was aware of the full range of adjustments.

TABLE 6.7
CROSSTABULATIONS[1]: ADOPTION OF CONSERVATION PRACTICES BY ATTITUDE ORIENTATION

Adoption	Orientation according to the combined scale				X^2	P<
	Ecocentric			Technocentric		
	1 %	2 %	3 %	4 %		
1. Energy loss prevention	50.0	63.5	44.9	41.9	7.92	.05
2. Reduction of energy use	84.4	78.8	57.7	55.8	15.36	.002
3. Alternative house design	-	3.0	-	-	5.47	N.S.
4. Efficient use of water	28.1	18.8	19.2	14.0	2.40	N.S.
5. Efficient use of appliances in the kitchen	56.3	31.8	21.8	14.0	18.69	.0004
6. Efficient use of Appliances in the house	65.6	69.4	51.8	41.9	11.35	.01
7. Use of and type of car	34.4	24.7	29.5	25.6	1.31	N.S.
8. Alternative transportation	46.9	31.8	15.4	14.0	16.79	.0009

[1] Degrees of Freedom = 3 in all cases

2. Respondents were aware of more conservation practices than they claimed to have adopted.
3. The number of people who were aware of and claimed to have adopted conservation adjustments decreased as the frequency of adjustments increased.
4. The existence of an adoption awareness gap suggests the presence of barriers to behaviour. Such barriers may be assumed to include time and cost constraints.
5. Variations in the level of awareness and adoption may partly be explained with reference to environmentally based attitudes.
6. Respondents with attitudes consistent with the ecocentric orientation tended to be more aware of and claimed to have adopted a larger number of conservation practices than respondents with attitudes consistent with the technocentric mode.
7. Awareness and adoption of conservation practices may be more clearly understood with reference to fundamental attitudes and beliefs than with reference to alternative explanatory variables, for instance, socio-economic criteria.

These results suggest that attitudes provide a valuable explanation of behaviour; however, the relatively low level of variation explained by attitudes suggests that a number of constraints or barriers exist which prevent a strong relationship between attitude and behaviour. The identification of these should prove invaluable in future studies in which attitudes and behaviour are analysed.

VII. CONCLUSIONS

A. SUMMARY

This study was undertaken to test empirically the influence of public attitudes and beliefs on energy preferences and behaviours, and to provide comparative data with previous research findings. This thesis has achieved two major objectives:

1. To replicate work analysing the influence of fundamental attitudes and beliefs on energy resource evaluations and preferences.
2. To extend previous research by examining the influence of such attitudes and beliefs on conservation behaviours.

The results of this survey may be summarized as follows.

1: *Members of the public can be differentiated in terms of their basic values, attitudes and beliefs, or world views.*

The successful design of a unidimensional attitudes scale that adequately discriminated between respondents according to a set of attitudes towards nature, technology, and the quality of life, supported the stated assumption. Further, the successful subdivision of the scale into four internally consistent groups, according to respondents' scores, suggested that the public could be differentiated in terms of their relative level of support for the ecocentric and technocentric modes.

2: *Fundamental attitudes and beliefs may be understood with reference to environmental and/or energy resource based issues.*

The results supported previous research findings, indicating that the public's fundamental values and beliefs, or world views, could be clearly understood with reference to environmental issues (Dunlap and Van Liere, 1978, 1984). Further, the development of an energy attitudes scale based on similar dimensions offered new evidence that the public's world views could be understood with reference to energy resource issues.

3: *Results of the analysis of the attitudes suggest a fairly widespread support for the environmentalist, or ecocentric, world view.*

The aggregation of respondents' scores on a series of attitudes statements, tapping the various dimensions of the ecocentric and technocentric modes, suggested that the public have generally accepted the dimensions of the ecocentric mode to a greater extent than theoretically expected. This was consistent with other research findings; as Dunlap and Van Liere state, "the degree to which they (the dimensions of the new environmental paradigm) have gained acceptance among the public is extremely surprising" (Dunlap and Van Liere, 1978, p. 17). Similarly, on the basis of a study conducted among a larger sample of Albertans at approximately the same time as the present survey, Jackson identified "a reasonably widespread acceptance of the conservationist point of view among Albertans" (Jackson, 1985a, p.133).

4; *Fundamental attitudes and beliefs do not appear to be influenced by socio-economic characteristics.*

Respondents' socio-economic characteristics were found to have no statistically significant influence on their environmentally based attitudes and beliefs. This was not supported by other research findings, in which discernable relationships between environmental attitudes and socio-economic characteristics were found (Dunlap and Van Liere, 1981). The fact that these studies surveyed much larger populations may partially explain the apparent contradiction in findings.

5: *There are significant variations in the public's perceptions of conservation, their expectations and preferences for energy resource options, and their short versus long run energy preferences.*

The public generally accepts the importance of individual efforts to conserve. Further, individuals evaluate themselves as either the same as or more conservation minded than their peers.

With regard to expectations and preferences for energy resource options in Alberta, the public generally expected the fossil fuel options such as oil and natural gas to provide the bulk

of Alberta's energy requirements. However, when preferences rather than expectations were analysed, support for the traditional energy options diminished, while support for the more ecologically benign options such as solar and wind power increased significantly.

In respect of long versus short run evaluations and preferences for energy resource options, similar findings were apparent. The results indicated that the public expected to see fossil fuel options providing Canada's energy requirements, but would prefer to see solar and wind power replacing these options in the long run. Such a distinction was even more apparent when public support for the hard and soft paths was analysed. Specifically, public support for the hard path was oriented to the present while support for the soft energy path increased as long term time horizons were envisaged. This complies with results reported elsewhere (Cunningham and Lopreato, 1977; Jackson, 1985a, 1985c) and suggests that support for the "soft energy path" may have entered the public consciousness to a greater extent than previously assumed (Jackson, 1985a). Such results imply that the public accepts our present dependence on fossil fuels, but would prefer to see a reorientation from our present dependence on the hard path, to a future dependence on the soft path.

6: *Interrelationships between fundamental attitudes and beliefs and energy resource preferences exist.*

An important variable for explaining variations in energy resource preferences relates to an individual's attitudes and beliefs or world views. Specifically, respondents with attitudes consistent with the technocentric mode were more frequently supportive of hard energy paths, while those who had attitudes consistent with the ecocentric mode were more frequently supportive of soft energy paths, at least for the long run if not for the short run.

7: *Members of the public are aware of and claim to have adopted a large number of conservation practices; however, the actual level of adoption is consistently lower than the level of awareness.*

Relationships between respondents' awareness and adoption of conservation practices were identified. The results suggested that the vast majority of the public were aware of, and claimed

to have adopted, at least one conservation practice, but the frequency of awareness and adoption tended to decrease as the number of adjustments increased. This supports previous research findings, as reported by Cunningham and Lopreato (1977), and Jackson (1980a). Further, public adoption of conservation practices was found to be consistently below stated awareness. This is consistent with Jackson's contention that awareness is a necessary but not a sufficient precondition for adoption (Jackson, 1980a). The absolute level of awareness and adoption of conservation practices was high among the public; however, the conservation practices most often recorded were those that created minimal inconvenience or cost. These conclusions are consistent with other research findings (Jackson, 1980a; McDougall et al., 1979; Murray et al., 1974).

8: *Interrelationships between fundamental attitudes and beliefs and conservation behaviours exist.*

Results suggested that variations in conservation behaviours could partially be explained with reference to fundamental attitudes and beliefs. Specifically supporters of the ecocentric mode were found to be more aware of and have adopted a greater number of conservation practices than those members of the public with fundamental beliefs consistent with the technocentric mode.

9: *Fundamental attitudes and beliefs provide a more useful mechanism for analysing interrelationships between attitudes, preferences, and behaviours, than the more traditional use of socio-economic variables.*

Socio-economic variables were found to be inappropriate explanations of variance in preferences about energy, while variations were adequately explained with reference to the public's fundamental attitudes and beliefs. Similar findings emerged for behaviour. Variations in respondents' awareness and adoption of conservation practices were better explained with reference to their attitudes and beliefs than with regard to their socio-economic characteristics. This provides new evidence on the appropriateness of analysing behaviours in respect to fundamental belief systems.

B. SURVEY LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Although some important conclusions may be drawn from the results of this thesis, a number of limitations can be identified and future research directions suggested. The limitations recognized and problems encountered with the completion of this thesis are now addressed.

First, the population sampled for this study was not identical to that of the general public. Though three enumeration districts were chosen in an attempt to sample a cross-section of the public, a city-wide sample would have been more appropriate. This was not possible for time and cost reasons.

A second limitation encountered relates to the use of questionnaire surveys. With respect to behaviour, respondents' *stated*, rather than their *actual* behaviours were analysed. This problem has been discussed in chapter 2; however, the results of this study must be viewed accepting this limitation.

A third and critical problem associated with the study is the formulation of attitudes scales. This study has replicated earlier attempts to generate scales (Dunlap and Van Liere 1978, 1984). Problems associated with such an approach include:

1. the assumed ability of these scales to measure fundamental attitudes and beliefs;
2. the assumed capability of all statements to tap respondents' actual attitudes and beliefs.

The first problem though recognised, was not reconciled in this study; however, the initial acceptance of this assumption was based on the very encouraging results reported from earlier research. The second problem was partially reconciled by the elimination of those statements that were found to be inappropriate in explaining variations in respondents' attitudes and beliefs.

Finally, the results reported in this survey may only be appropriate for the specific areas studied; however, they are probably applicable at least in a Western Canadian context. Further research in urban and rural areas is required to substantiate general research findings.

From the results and conclusions drawn from this study a number of future research directions may be suggested. Interrelationships between fundamental attitudes and beliefs and energy preferences and behaviours have been determined for Edmontonians. It is important to analyse whether other populations hold similar attitudes and beliefs and whether they can be differentiated according to these world views. Further, it is necessary to determine the level of commitment among various populations towards the ecocentric and technocentric modes. This should provide useful information on general public attitudes and preferences for the future, data which may be extremely useful to policy makers. An alternative direction of research would be to analyse specific sub-sections of the public. Some work in this field has been undertaken (Cotgrove, 1982; Dunlap and Van Liere, 1978), to analyse environmental group organisations and business men; however, a more appropriate study group may be government officials, with their direct impact on the decision making processes.

This and other studies are beginning to provide a series of consistent results on attitudes, preferences and behaviours towards energy and other social issues; however, much of this research is in its formative stages and replication is required. Further, future studies should analyse alternative attitude statements for measuring commitment to the ecocentric and technocentric modes. These may prove to be more appropriate in identifying the constructs of the ecocentric and technocentric modes than Dunlap and Van Liere's statements. Thoughout the study it has been apparent that a variety of factors (barriers) may have served to modify the direct influence of respondents' world views on their stated preferences and behaviours. The analysis of such barriers was outside the scope of this study; however, some barriers suggested included time and cost constraints. Further work directed at identifying other potential barriers and subsequently determining the actual influence of these on the relationships, may prove valuable.

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APPENDIX A

The Questionnaire

ATTITUDES AND PREFERENCES TOWARDS THE ENVIRONMENT AND ENERGY RESOURCE OPTIONS

THIS FIRST SECTION DEALS WITH YOUR OPINIONS ABOUT ENERGY AND ASSOCIATED GENERAL ISSUES. REMEMBER THAT THERE ARE NO RIGHT OR WRONG ANSWERS. I AM INTERESTED ONLY IN YOUR OPINION.

1. Here are some statements which have been made about energy resources and energy policy, and I would like to know whether you agree or disagree with them. Please read each statement carefully and circle the number which corresponds most closely to your opinion regarding that statement.

   Here is what the numbers mean:

   1 indicates you strongly agree with the statement
   2 indicates you agree, but not strongly
   3 indicates you are neutral or indifferent
   4 indicates you disagree, but not strongly
   5 indicates you strongly disagree with the statement

		STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
(A)	There is no threat of an oil or natural gas shortage, only a shortage of known and identified resources	1	2	3	4	5
(B)	The price of energy should include the cost of preventing or repairing environmental damage due to energy development	1	2	3	4	5
(C)	Solving energy problems is best left to the experts	1	2	3	4	5
(D)	The solution to energy problems is the development of renewable sources of energy such as solar or wind power	1	2	3	4	5
(E)	Environmental quality may have to be sacrificed to guarantee adequate supplies of energy ...	1	2	3	4	5
(F)	Canada's supplies of oil and natural gas are rapidly being depleted	1	2	3	4	5
(G)	Improved technology is the key to avoiding energy shortages in the future	1	2	3	4	5

	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
(H) Energy costs must be kept down, even if this means a reduction in environmental protection ...	1	2	3	4	5
(I) Nuclear power plants can be operated without a threat to the quality of the environment.	1	2	3	4	5
(J) In the future individuals should be expected to purchase solar or wind devices to meet part of their own energy requirements	1	2	3	4	5
(K) The development of nuclear power plants is the best way to meet future energy needs	1	2	3	4	5
(L) Moderation in consumption at the individual level can contribute significantly to energy conservation	1	2	3	4	5
(M) The environmentalists needlessly interfere with energy projects and the rapid development of our oil, natural gas, and coal resources	1	2	3	4	5

THE NEXT SECTION ASKS A FEW QUESTIONS ABOUT YOUR OPINIONS ON CONSERVATION AND THE WAYS IN WHICH MEMBERS OF THE PUBLIC, LIKE YOURSELF, CAN SAVE ENERGY.

2. How important do you feel it is that individuals like yourself make an effort to cut down the amount of energy that they use? (Circle one number).

NOT AT ALL IMPORTANT 1
NOT TOO IMPORTANT 2
SOMEWHAT IMPORTANT 3
VERY IMPORTANT 4

3. In comparison with other people, would you say you are more conservation-minded, less conservation-minded, or about the same?

MORE CONSERVATION-MINDED 1
LESS CONSERVATION-MINDED 2
ABOUT THE SAME 3

4. Please list the ways that you know of in which individuals and households can conserve energy.

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

H. _____

I. _____

J. _____

5. Which of the preceding list have you or your household adopted in the last two years? (Please check the appropriate box corresponding to actions which you listed in question 4).

A. ☐

B. ☐

C. ☐

D. ☐

E. ☐

F. ☐

G. ☐

H. ☐

I. ☐

J. ☐

THE NEXT FEW QUESTIONS DEAL WITH YOUR OPINIONS ABOUT VARIOUS KINDS OF ENERGY FOR THE FUTURE.

6. In the year 2000, which <u>two</u> of the following do you think <u>will be the main sources of energy</u> used in Alberta? (Circle <u>two</u> numbers).

OIL	1
COAL FOR DOMESTIC USE	2
NATURAL GAS	3
HYDRO-ELECTRIC POWER	4
NUCLEAR POWER	5
COAL FOR ELECTRICITY GENERATION	6
SOLAR ENERGY	7
WIND ENERGY	8
BIOMASS FUELS	9
OTHER (specify)	10

7. In the year 2000, which <u>two</u> of the following sources of <u>energy would you most prefer to be used</u> in Alberta? (Circle <u>two</u> numbers).

OIL	1
COAL FOR DOMESTIC USE	2
NATURAL GAS	3
HYDRO-ELECTRIC POWER	4
NUCLEAR POWER	5
COAL FOR ELECTRICITY GENERATION	6
SOLAR ENERGY	7
WIND ENERGY	8
BIOMASS FUELS	9
OTHER (specify)	10

8. How would you rate each of the following, as ways in which Canada might make a major effort to improve its energy situation? (Circle where appropriate).

	POOR	FAIR	GOOD	VERY GOOD	EXCELLENT
1. COAL	1	2	3	4	5
2. CONSERVING ENERGY	1	2	3	4	5
3. OIL AND NATURAL GAS	1	2	3	4	5
4. SOLAR ENERGY	1	2	3	4	5
5. BIOMASS FUELS	1	2	3	4	5
6. NUCLEAR POWER	1	2	3	4	5
7. OIL FROM TAR SANDS	1	2	3	4	5

9. In the short run (say the next five years), which of the things listed in Question 8 do you think would help to improve Canada's energy situation the fastest? (Put number of item in appropriate box).

☐ BEST IN THE SHORT RUN

☐ SECOND BEST IN THE SHORT RUN

10. In the long run (beyond the year 2000), which of the things listed in Question 8 do you think Canada should depend on most to improve its energy situation? (Put number of item in appropriate box).

☐ BEST IN THE LONG RUN

☐ SECOND BEST IN THE LONG RUN

THIS SECTION DEALS WITH YOUR OPINIONS ABOUT SOME GENERAL ISSUES.

11. As in Question 1 please circle the number which corresponds most closely to your opinion regarding each statement.

	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
(A) In the long run, there are no limits to the extent to which we can raise our standard of living	1	2	3	4	5
(B) The earth is like a spaceship with only limited room and resources	1	2	3	4	5
(C) We can continue to raise our standard of living through the application of science and technology	1	2	3	4	5
(D) Plants and animals exist primarily to be used by humans .	1	2	3	4	5
(E) Humans must live in harmony with nature in order to survive	1	2	3	4	5
(F) Economic growth improves the quality of life for all Canadians	1	2	3	4	5
(G) The balance of nature is very delicate and easily upset	1	2	3	4	5
(H) Too much has been written about the costs and problems of economic growth, and not enough about the benefits	1	2	3	4	5
(I) Humans have the right to modify the environment to suit their needs	1	2	3	4	5
(J) Canadians are going to have to dramatically reduce their consumption of material goods over the next few years	1	2	3	4	5
(K) Science and technology often do as much harm as good	1	2	3	4	5
(L) When humans interfere with nature, it often produces disastrous consequences	1	2	3	4	5

		STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE
(M)	More emphasis should be placed on teaching children about nature than on teaching them about science and technology	1	2	3	4	5
(N)	We cannot keep counting on science and technology to solve mankind's problems	1	2	3	4	5
(O)	In general, the Canadian people would be better off if the nation's economy stopped growing.	1	2	3	4	5
(P)	Mankind was created to rule over the rest of nature	1	2	3	4	5
(Q)	To maintain a healthy economy we will have to develop a "steady-state" economy where industrial growth is controlled	1	2	3	4	5
(R)	Humans need not adapt to the natural environment because they can remake it to suit their needs	1	2	3	4	5
(S)	Improved technology is the key to a better society and prosperity in the future	1	2	3	4	5
(T)	We are approaching the limit to the number of people the earth can support	1	2	3	4	5
(U)	Mankind is severely abusing the environment	1	2	3	4	5
(V)	There are limits to growth beyond which our industrialized society cannot expand	1	2	3	4	5
(W)	Rapid economic growth often creates more problems than benefits	1	2	3	4	5

APPENDIX B

The Letter of Introduction

DEPARTMENT OF GEOGRAPHY
TELEPHONE (403) 432-3274

THE UNIVERSITY OF ALBERTA
EDMONTON, CANADA T6G 2H4

June 6, 1984

Dear Sir/Madam:

In this package is a questionnaire which is being delivered to approximately four hundred people living in Edmonton. The purpose of the questionnaire is to find out what Edmontonians think about the environment and about energy. The survey is not connected with any government agency but is being used for academic purposes, as part of my research for a Masters thesis in the Department of Geography at the University of Alberta.

Like all the other respondents, your name was selected at random from the residents of Edmonton. The success of any survey like this depends on the cooperation of everyone, and so I respectfully ask for your help in completing the questionnaire, which will be collected shortly after delivery. You will probably find that it takes only about twenty minutes to complete.

I wish to emphasize strongly that your answers will be treated in the strictest confidence. In fact, once your questionnaire is returned, I will have no way of identifying who has filled it out.

Please take the time to complete the questionnaire, and then leave it in your mail box for collection. If you have any questions, you may call 432-4158.

Thank you.

Yours sincerely,

S Farbrother

Simon C. Farbrother,
Graduate Student.

SCF/sf